73 Amateur Radio Today

AUGUST 1992
ISSUE #383
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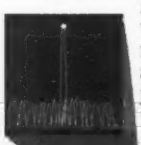

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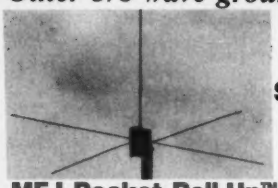

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Roll up this half-wave 2 Meter J-antenna and stick it in your pocket!

This new MFJ Pocket Roll-Up™ is the perfect gain antenna for traveling.

Get home station performance on the go. Just hang your Pocket Roll-Up in the clear, plug the handy BNC connector into your handheld and enjoy some great QSOs.

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1/4 Wave Ground Plane

MFJ-1740
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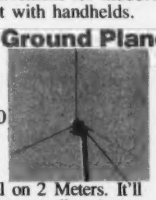

The MFJ-1740 is the most inexpensive way to put out a potent FM signal on 2 Meters. It'll bring up repeaters as well or better than *any* 1/4 wave ground plane — even if it cost twice as much.

The *improved* MFJ-1740 1/4 wave ground plane minimizes feedline radiation for more useful radiated power, reduced TVI and noise pickup by the coax shield.

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You get MFJ's Rapid-Tune-Radiator™ for easy tuning and low loss ceramic antenna insulator for maximum radiated power. Single included U-bolt mounting for 1 to 1 1/2 inch mast. Cutting chart included for 220/440 MHz. Made in USA.

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No Matter What Guarantee

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For *maximum range* while mobile, use MFJ's ***Maximum Gain™*** 5/8 Wave 2 Meter Mobile Antenna. You'll get the maximum possible theoretical gain of any single element mobile antenna!

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You get low SWR so your rig can safely deliver maximum power into your antenna. It's rated at 300 watts PEP so you can use any mobile rig plus a mobile amplifier.

You get a heavy-duty magnet mount that holds your antenna tight at highway speed and a chrome plated magnet base that keeps it looking good for years.

You get has a stainless steel radiator that'll endure years of harsh mobile use and 12 feet of coax cable with connector.

You get MFJ's famous one full year ***No Matter What™*** *Unconditional* Guarantee.

The MFJ-1728 ***Maximum Gain™*** 5/8 Wave Mobile Antenna gives you *maximum* mobile range *and* the most for your money. Get yours today.

MFJ Dual 5/8 Wave Super Gain™

2-Meter Antenna . . . ***direct feed gives you irrefutable real gain.***

MFJ-1764 **$34.95**

This new MFJ Super Gain™ 2-Meter antenna *directly feeds* two full size 5/8 wave radiators *and makes both elements strongly radiate*. You get *irrefutable* real gain.

Plus, *you get additional gain* for FM and Packet because your mast doubles as a reflector. There's plenty of antenna gain to work stations off the sides and back — your signal is just stronger in the direction the MFJ-1764 faces.

The result? You get more range to reach distant repeaters and much better local coverage on direct channels and Packet.

You get an extremely wide 10 MHz 2:1 SWR bandwidth . . . excellent ferrite choke balun feedline decoupling to eliminate wasted power due to field pattern distortion . . . shunt choke for bleeding off unwanted static . . . strong lightweight aluminum construction protected by MFJ's Permanent Molecular Bonding Technology™.

It's fully assembled — simply attach radiators — no tuning required. Mounts vertically for FM and Packet or horizontally for SSB. Easy-to-install with single U-bolt (supplied) on any 1 to 1 1/2 inch mast or tower leg. Weighs 1 1/2 pounds, two 47 inch radiators, 23 inch boom. Made in U.S.A. One year Unconditional Guarantee.

Double your Gain with direct feed!

You can double the gain of one MFJ-1764 5/8 Wave Super Gain™ 2-Meter Antenna by mounting two MFJ-1764s one above the other on the same mast and *directly feeding* both. Order MFJ-1766, $89.95, includes 2 MFJ-1764 Super Gain™ 2-Meter Antennas and a *Direct Feed* Power Splitter/Cable Harness.

If you already have two MFJ-1764s, order MFJ-1765, $29.95, *Direct Feed* Power Splitter/Cable Harness to feed your two MFJ-1764s.

Portable 3 element Yagi for 2 M

MFJ-1763 **$39.95**

You can set up or take down MFJ's new *portable* 3 element 2 Meter Yagi in seconds! Elements simply screw into the boom.

You can take it with you wherever you go and have the "oomph" and directivity of a beam.

It's easy to store and sturdy enough to use as your home station antenna.

You can mount it vertically for FM or horizontally for SSB. You can easily *center* mount it on a mast or *end* mount it on a tower leg with a single U-bolt (included). It's great for packet and PacketCluster™.

Its compact 2 3/4 foot boom gives you a calculated gain within 1 dB of a four element Yagi with a boom nearly twice as long.

Extra thick elements maintain high gain and directivity over virtually the whole 2 Meter band. A ferrite choke balun gives you excellent feedline decoupling. Coax coupling is further reduced by mounting the SO-239 connector behind the reflector.

Elements and boom are made from strong lightweight aluminum and protected by MFJ's Permanent Molecular Bonding Technology™.

Weighs just 2 pounds. Boom is 30½ inches. Made in USA.

Dual Band Mobile

Mobile Antenna for 144/440 MHz

MFJ-1724B
$14.95

For $14.95, you get an MFJ *dual band* magnet mount mobile antenna for 2 Meters *and* 440 MHz! Plus, it's covered by MFJ's famous One Year *unconditional* **No Matter What™ Guarantee.**

The MFJ-1724B is a 1/4 wave on 2 Meters and a gain antenna on 440 MHz — it's perfect for dual band radios.

Low SWR across both bands lets your rig safely deliver full power into your antenna.

The stainless steel radiator will withstand the toughest mobile service. It's only 19 inches tall so you can park in your garage without knocking over your antenna.

The MFJ-1724B handles 300 watts PEP, has 15 feet of coax and has an extra powerful magnet to hold it steady — even at highway speeds.

HT Range Extenders

Telescoping antennas for handhelds

A. B. C.

A. The Long Ranger™ 2 Meter Halfwave. MFJ-1714, $16.95. For really long range this MFJ endfed halfwave is hard to beat. It outperforms a 5/8 wave on a handheld because the 5/8 wave needs a ground plane. The MFJ halfwave doesn't. It's shorter, lighter, has more gain and places less stress on your antenna connector than a 5/8 wave antenna. When collapsed, it performs like a rubber duck. 40" extended, 10 1/2" collapsed.

B. The Dual Bander™ for 2 Meters and 440 MHz. MFJ-1712, $14.95. Got a new dual band handheld or separate units? One antenna fits all. It's a 1/4 wave for 2 Meters and a 5/8 wave with gain for 440 MHz. 7 1/4" collapsed, 19" extended.

C. The Pocket Linear™ 3/8 Wave, 2 Meters. MFJ-1710, $9.95. Carry this pen size antenna in your pocket like a ballpoint pen. When you're using your rubber duck, on the fringe and noisy, put on The Pocket Linear™, extend it to 24 1/2" and carry on your QSO. Has pocket clip. 5 1/4" collapsed.

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LETTERS

Number 1 on your Feedback card

From the Hamshack

Brent Newman, Duncan OK I was a ham wanna-be. The only problem was that I could not find information about amateur radio. After a last and unsuccessful search at the local library, I was convinced that I would never become a ham. Extremely discouraged, I grabbed a magazine off of the library's magazine rack and plopped down on the ugly green reading couch. After reading a few articles I tossed it aside and scanned the assortment of magazines for one that might be of interest to me. Then, on the last shelf near the floor, my eyes found a Godsend: *73 Amateur Radio Today*.

Before anyone could bat an eye, I had snatched the magazine from its resting place and was soaking in every last bit of knowledge from all 88 informative, interesting and inspiring pages. As I gleaned insight from your magazine, the babbling baby throwing books, the giggling girls running down the aisles, and the beautiful babe sitting across from me all faded out of my mind, making way for the most important input before my eyes.

A librarian later told me that someone donates an issue of this magazine to the library every month. "Thanks!" to whoever donates *73 Magazine* to that small library in Duncan, Oklahoma. And an especially big thanks to Wayne Green and his team for creating such an outstanding magazine.

I am no longer a ham wanna-be; now I'm a ham soon-to-be.

Bob Shafer K4IPH, Vandergrift PA I am writing to set you straight (excuse the pun) on your so-called facts. Believe what you may about homosexuality but it is not genetic nor is it incurable. Your problem stems from your tongue-in-cheek attitude toward God, our Creator. This letter is to let you in on some Good News. Jesus Christ is GOD, the Son of the Father. All things were made through Him, and without Him nothing was made that was made. He became a man, coming in flesh, born of a virgin. He died in our place, instead of us, under the punishment of God for our sins. In His death He took the penalty that we deserve. In so doing God was, in Christ, reconciling the world to Himself, imputing our trespasses to us. Jesus became our ransom to purchase us from the domination and penalty of sin. After He died on the cross He was buried. On the third day He rose from the dead according to the scriptures. This means that He literally came back to life in His physical human body. In raising Him from the dead God declared Jesus to be Lord of all, and the Messiah of Israel (the future world ruler from Israel promised in the Hebrew scriptures). After His resurrection, the Lord Jesus Christ appeared to His apostles and disciples, and was seen by them for 40 days. He then ascended to heaven to sit at the right of God the Father.

You may receive eternal life, forgiveness of all your sins, and rescue from everlasting punishment simply by believing this message in your heart.

This is the Good News I would like to proclaim to you and homosexuals, racists, etc. God will forgive you for this *sin* and all others because He paid for it at the Cross of Calvary. The sin of homosexuality and lifestyle is a choice, not an act of nature (God, if you like), because man does not want to take responsibility for his own actions. If you doubt what I say, just read what God says about this matter in the book of Romans 1:18-32. God does not hate homosexuals; neither do I. He hates the sin they commit and any sin we commit against Him. We are hopeless without the forgiveness and mercy that we can receive from the Lord Jesus Christ. God the Father gave us His perfect sinless Son to die for us, who are all sinners. We all deserve to burn in hell, but He gave us His Son for a means of escape.

A closing comment: You seem to equate homosexuality with racism; this is wrong. Yes, racism is sin the same as homosexuality. God only created one race and that is the human race for which He died. But you seem to want to put homosexuals in a minority status, of which they are NOT; this is wrong. It sounds as if you have been brainwashed by the liberal press and militant homosexual groups. Well, Wayne, I figure this letter will cause you to seethe in hatred for my Lord and Saviour even more, but the Scriptures say: "For the message of the cross is foolishness to those who are perishing, but to us who are being saved it is the power of God." (1 Corinth. 1:18) I will pray that the Lord grant you mercy and open your now-closed eyes to the TRUTH. (THE LORD JESUS CHRIST)!!!!!!!

Seethe in hatred? No, not at all. I enjoyed your letter. So you think that because I have a different set of beliefs that I have been brainwashed by militant homosexual groups? Au contraire mon ami—my brainwashing was for cleansing purposes, to wash away the barriers of ignorance, religious and political dogma—to enable me to have an open enough mind to read more than one book—to read what thousands of intelligent people have written—and to try to make sense of all this information epistemologically.

The liberal press is frustrated with me since I appear to them to be a staunch conservative. Militant homosexuals are frustrated with me because they don't want to believe that their behavior is genetically controlled. We all like to think we have free wills. Indeed, many people actually believe this.

Of course it was only about a hundred years ago that scientists called anyone crazy who believed that meteors were real. Plate tectonics is even newer, as are relativity, quantum and chaos theories. Yet each of these have changed our understanding of the world—and each is understandable, if one makes the effort. Little of value is available without effort, I hope you'll agree.

You didn't say which of the organized commercial religions you are selling, but you certainly are a truly inspired salesman. One thing puzzled me Bob—since the number seven is the mark of the devil, was your use of seven exclamation points at the end of your letter meant to tell me not to believe anything you wrote? That was the message you sent! . . . Cheers, Wayne

Don Smithana W9FFG, San Diego CA Being a "builder/experimenter" I feel highly about your magazine and the practical articles it contains. Aside from the construction articles, the advertising is one of the most interesting and beneficial parts of *73 Magazine*. Before considering any purchase, I always read the ads in your magazine. I believe you have to be somewhat older to realize the importance of advertising such as this.

There is an old saying, "Time is the best teacher, but leaves no students!" This was again evidenced in your fine editorial (Worrywart at Dayton) in the March 1992 issue. Actually it is more than a time to WORRY, it is a time to PANIC! Where are the skilled artisans of the electronic age, the deep resource of trained technicians who have more than computer buzzwords as a vocabulary? Your concern is well founded and I hope your voice of vision is not relegated to a faint whining in the dark wilderness. Our situation of technical jobs and skills has reached critical mass. Our "amateur radio fraternity" can help to focus on the national problems.

Having just returned from a business trip to the Tokyo area, I found all the more truth to your editorial. For those familiar, the "Electronic Experimenters section" of Tokyo is centered around Akihabara near the downtown area. In America, the whole area might be condemned as being an eyesore or firetrap. But, its tiny booths and display areas abound with the latest electronic devices as well as a wide variety of modern electronic parts and hardware. Not surplus military such as we used to find in cities like Dayton, New York, Chicago, etc. I am sure these areas in America helped spawn many new-wave electronic corporations. With the parts displayed today in Japan one can build prototypes of a most modern type. And I am sure new industries are built upon some of these experimental offerings.

What am I getting at? That we have lost much of the infrastructure of parts availability to actually engineer, to produce a quality product in the manner which helped found several of our major industries. It is the grass-roots effort of thousands of talented electronic aficionados that can build an industry—and the computer people in America know what many of these industries are.

Now Akihabara and Kanda areas of Tokyo were not always electronic centers. After the war I was one of the few television engineers to visit the area to buy parts, radio parts of a most primitive type. And long before that, it was an area of flat fields with red leaves on the trees, Aki ha bara (red leaf flat fields). What a major transformation! And it is one we must also accomplish if we are to effectively provide high-tech jobs for those who want them. No, we should not only WANT them, we NEED them. It may be that we need editorials such as yours to wake up the sleeping giant of apathy which resides in too many of us.

Jonathon Grimes KB4UHK, Kingsport TN I am a Tech-Plus licensee and have been licensed since I was 13, in 1986. Wayne, I would like to thank you and the staff for making a progressive, well-written magazine that is ready to go through all the risks of publishing in order to be exciting. (The same goes for *Radio Fun*—I subscribe.) I have been QRT for about three years until I got to read your magazine for the first time. What a change from *QST* and *CQ*! Your writers are encouraging and educating the readers from learning Morse to using spread spectrum, while the other magazines are still using three or more pages for Straight Key Night. Well fine, let 'em all live in the 19th century and leave the new scene alone. By being a mob of crotchety old geezers the old crowd has not succeeded in maintaining a country club atmosphere on our frequencies. Instead, they have alienated themselves from the new influx of hams and their peers who had a little more vision and a great deal more courage. So let's just sentence the spark gap crowd, the ARRL and *CQ* to 75m and the occasional pointless contest and be done with it, so your magazines can stop using up so much of their free space complaining through your editorials and letters like this.

Tom Rice WB6BYH, Livermore CA Wayne, in your June 1992 editorial you mentioned how the infamous Doyle Letters revealed that the ARRL president was paid by Hallicrafters to gain space in *QST*.

This tickles me, but for another reason. I have always wanted to know how it was that the Republic Studios had all that neat Hallicrafters stuff on display in their serials.

We're both old enough to remember the Saturday afternoon movies; for me, the serials were the big draw and probably responsible for making me the techno-nerd I am. I've now bought most of my old favorites on tape and, regressing a bit, still get a kick out of reliving those wonderful afternoons.

Anyway, I see all these neat old radios. In the earlier years, they were assorted brands: the Abbotts, the Bretings and so forth. But after 1940 or so, they're all Hallicrafters: S-20R, SX-24, SX-28, HT-9, etc.

So I have to ask: What did Bill Halligan have to do to turn every kid in town on to Hallicrafters radios for so many years? They were always the current models for the year the film was made, too.

Why were there never any other makes? (One exception was the National NC-240 seen in the spy movie "The House on 92nd Street," but that wasn't a Republic film.

This might make a joyful piece for *73*. I'm in full agreement with those who want more historical stuff, but not just League history; I really enjoyed your dad's early flying tales. Since we hams are mostly a bunch of old farts, a little nostalgia might just be in order. You'll never get us back to the bench and the soldering iron.

(I still have my old Sky Buddy from 1940. Should I build a QSL-40 to go with it? I've got the 6L6 and 40 meter xtals.)

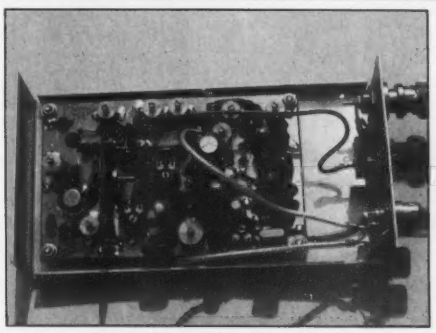
And do you remember all the B-movies from Producer's Releasing Corporation? PRCs were always el cheapo. I remember their using an S40 as a transceiver—switching the standby switch to pretend to transmit.

I'll bet there's someone out there who could do a great article on the old B's and the Hallicrafters radios in them . . . Wayne 73

73 Amateur Radio Today

August 1992
Issue #383

TABLE OF CONTENTS



Build an ATV transmitter . . . see page 22.

FEATURES

8 The ViewPort VGA Color SSTV System
At last—a versatile slow-scan TV program and interface for the IBM PC.....KA2PYJ

18 The Compact-A-Loop Antenna
80 meters for the apartment dweller.....G2BZQ

22 ATV Transmitter, Part I.
Get on ATV easily and cheaply.....K2MQJ, KA2CWL

30 The Explorer
HF receiver for 40 and 80 meters.....K5WMS

36 Digital ALC
A simple way to get the best out of any transmitter.....N7APE

48 A Frequency Counter Upgrade
Accuracy at the flip of a switch.....KD9ZT

REVIEWS

42 AEA's Weather FAX Decoder
HF FAX on an IBM PC.....N7IDB

46 The Larsen KG 2/70 Glass-Mounted Antenna
Glass-mounted dual-band.....N1GPH

Cover: Slow-scan or fast-scan . . . amateur TV is fun . . . and easy!
Cover photo by Bill Brown WB8ELK & David Cassidy N1GPH.

DEPARTMENTS

58 Above and Beyond
73 Ad Index
70 Ask Kaboom
50 ATV
84 Barter 'n' Buy
68 Dealer Directory
17 Feedback Index
58 Ham Help
64 Hams with Class
66 Hamsats
54 Homing In
2 Letters
4 Never Say Die
72 New Products
88 Propagation
57 QRP
7 QRX
62 Packet & Computers
68 Random Output
60 RTTY Loop
74 73 International
82 Special Events
86 Uncle Wayne's Bookshelf
60 Updates

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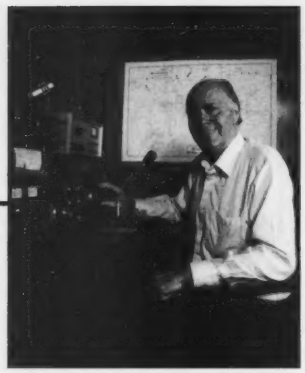

Inner City Hams

One thing you can bet on, none of those rioters you saw burning and looting the inner city businesses were hams. The rioters were, for the most part, gangs on a rampage. So how come we have such persistent poverty? Why are our cities infested with increasingly large gangs? Well, before we can do anything about all this we have to understand what's gone wrong. If you don't know what's broken, you sure aren't likely to fix it. Alas, I see no hint that our politicians have a clue as to what's gone wrong.

Yes, there are lots of symptoms—any illness has symptoms. And until fairly recently all doctors could really do was treat symptoms and wait for the patient to cure or kill himself. So we are dwelling on the symptoms of poverty, while ignoring the cause. We're trying to cope with lousy, overpriced housing, welfare, drugs, crime, school dropouts, pimps, the homeless, street gangs, organized crime, pornography, and so on.

For the last few months I've been doing a bunch of research on our educational system. Oh, we know it's failed us in comparison with the educational systems of all other developed countries. We've seen one report after another citing our American educational shortcomings. As a member of the New Hampshire Economic Development Commission Educational Subcommittee and the New Hampshire High Tech Council's Educational Subcommittee, I've been listening to and talking with a wide range of educators. Further, I've also been doing my homework, reading the latest books on what's gone wrong with our system, plus some very good ideas on what to do about it.

The more I've read and heard, the more convinced I am that the root cause of poverty in America is the direct result of our crummy educational system. It isn't the blacks. It isn't the Hispanics. It isn't drugs. It isn't laziness. It isn't even our incredibly awful welfare system. It's our totally out-of-date educational system which has generated this incredible and expensive, embarrassing mess. It's also got a lot to do with so few kids being interested in technical hobbies such as amateur radio—so we have a vested interest in educational reform.

Actually, reform is too modest a term for what's needed. We have to completely reinvent education, not just make some changes. Alas, we also need to reinvent our political system too. I think we can almost agree that it's failed us. It was this failure which opened the door for even worse political systems such as fascism, socialism and communism. Most of us are gradually becoming aware of how bad the mess in Washington is—and we have no reason to hope that it's much better with our state governments.

Well, let's look at what we can do to clean up the educational mess first and then, if we have any survivors, we can tackle our governmental messes. If we can turn around education in America, we'll be the strongest country in the world in technology, electronics, money and power. If we don't, we're heading down the road of poor old Britain—previously known as Great Britain. Their educational system, while slightly different from ours, also sucks.

The world, and our schools, moved from the agricultural age to the industrial age. Now it's in the information age. Our schools managed the change from agriculture to industry, going from about 75 days a year to 180. The problem is that they haven't been able to come to grips with the information age. And this is going to take a lot more than adding a few courses to the curriculum. It's also going to have to fit in with the changes in family life which television, divorce and working parents have brought about. The family life of 50 years ago is almost completely gone. Children aren't being educated during their first few years at home by their mothers any longer, they're parked in day-care centers, hypnotized by "Sesame Street."

When you consider that it's during the first few years that children's brains develop and that without good stimulation the neuron circuits don't develop well—a growth process that once missed can't be repaired later—you start getting a hint as to why so many of today's children can't read, can't even speak very well, have short attention spans, and are unmotivated. And of course, all this is made even worse in the ghettos, where there are so many fatherless homes and 80% of the children are illegitimate.

Adding to that incredibly bad start, which permanently brain-damages children, we then subject them to a government-run educational system which is largely irrelevant to their lives. We don't teach them about how to work with others, how to select a mate, or the things they will need to know to work as carpenters, plumbers, electricians, salespersons, telemarketers, and so on.

During year two, when they are learning to talk, are we teaching them American English, or ghetto argot? Yes, English is "whitey talk," but it's also a key to making success possible in this country. By the time they're starting in kindergarten their speech patterns are so permanently built into their brains that it takes an enormous amount of work to overcome them. Just as it's easy to teach young children to speak many languages, all without any accent, if we bypass the growth period when their minds are building the needed neuron circuits for speech, they'll never have them. We can teach them a foreign language when they are in high school, but it's ten thousand times more difficult and they'll never be able to speak without an accent. Well, the same goes for the black argot and Hispanic Spanish.

The black community also is screwing up their kids by emphasizing the wrong role models. Blacks tend to look up to athletes, the clergy, entertainers, drug dealers and pimps. This certainly doesn't encourage kids to think in terms of working or being an entrepreneur. This is one reason why the Koreans have been able to be so successful setting up their stores in black neighborhoods.

By first depriving blacks of the ability to speak American English, and an interest in learning or working, and then dumping them into schools which try to get them to memorize facts about history, geography, literature, and math—things they'll never need, we're dooming them to poverty. They must, by law, go to the public school they're assigned. Doesn't this whole program qualify as cruel and unusual punishment? Is it any wonder we have so few black hams managing to survive this educational holocaust?

The more I read about our educational system, the more inclined I am to agree with the few brave educators who are crying for radical changes. They claim that with a better start during the first through fifth years, kids could learn to read and write in a year or two and be able (and motivated) to pursue their own educations from then on. Understandably, many teachers and teacher unions are ready to fight to the death to preserve the present system.

Kids work better in teams, with coaches instead of teachers. It's called cooperative education and it's worked miracles where it's been tried. But the most important change needed is in day care, where kids need to be exposed to the stimuli their brains need to help them develop during their early years. A public investment in better preschool education will repay its cost a thousand times over in lower crime rates, a gradual reduction in single parent families, a better educated work force, and a higher standard of living for everyone. We have no need for poverty. It benefits no one. It is possible for everyone to make more money.

With better preschool education, and with a school system which is relevant to life for kids—a non-compulsory system—we can turn this inner city mess around. It's time to stop blaming the street gangs for crime, drugs, burning and looting, and fix the situation which has resulted in this disaster.

A Street Gang Solution

So what can we do with the mess we have right now, with tens of thousands of uneducated blacks and Hispanics in street gangs? It's too late to read and speak English, so are they a completely lost cause? They need to be encouraged to learn skills so they can work in trades. If we had prisons which really reformed people instead of merely making them better educated criminals, prison might be a good solution. That would help break the lousy role model patterns being handed down from generation to generation.

But prison not only doesn't reform, it also costs like crazy. Prison costs are higher than health costs and are rising even faster. But suppose we could both turn prisons into educational centers to teach skills and lower their costs by 90-110%? Think that might work? With prisons costing around $25,000 a year per prisoner, it's no wonder so many petty criminals are being released by our hopelessly overcrowded system. And that hardened criminals are being paroled early.

If we can both reduce prison costs and turn them into re-education centers, we'll be on our way toward solving a good deal of our crime and inner city gang problems. But how can we go about teaching skills and changing

Continued on page 78

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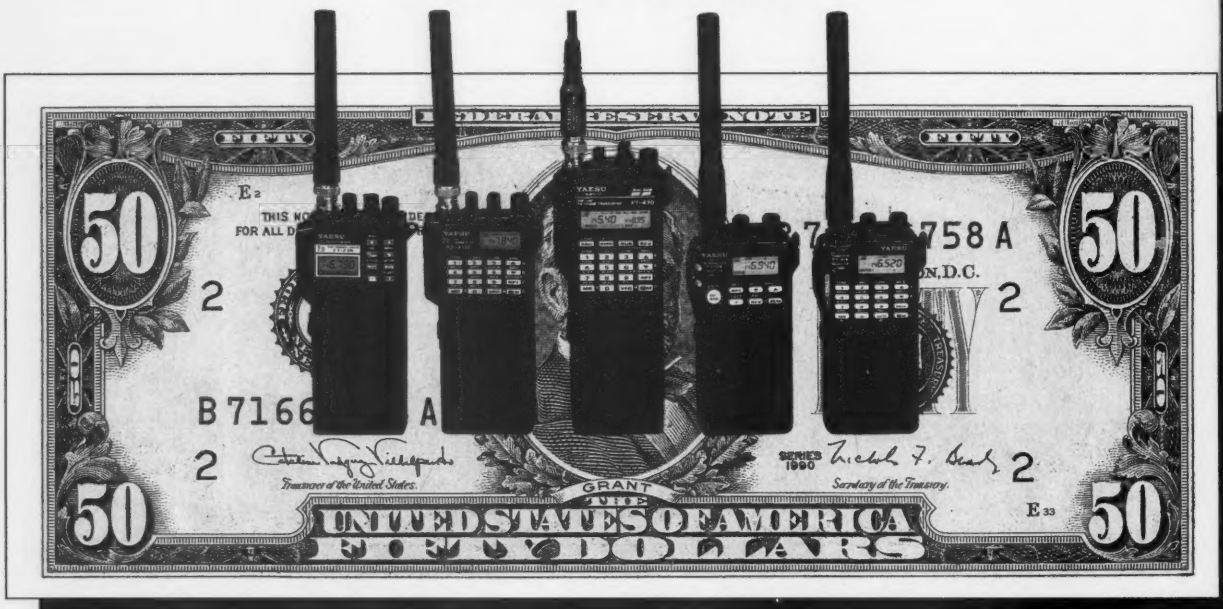

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Voice of America Club Gets K3VOA Callsign

The FCC assignment of a specific callsign to an amateur radio club made up of employees of another government agency is raising a lot of eyebrows in ham circles.

In an unprecedented move, the FCC has issued a license modification to the Voice of America Amateur Radio Club to change its amateur radio callsign from K3EKA to the more recognizable callsign K3VOA.

For more than 10 years the club has made several informal inquiries in an effort to secure a "VOA-suffix" callsign. In every case the FCC cited the request was specifically prohibited by the regulations. Rule 97.17(f) states: "A callsign will be systematically assigned to each station. FCC will issue public announcements detailing the policies and procedures of the callsign assignment system. The FCC will not grant any request for a specific callsign."

During VOA's 50th anniversary in February, the new USIA Director of the Bureau of Broadcasting (which includes VOA), Chase Untermeyer, expressed a desire to visit the VOA ARC ham shack. Club president, Al Brown WA3FYZ, felt that this would be a perfect opportunity to ask Mr. Untermeyer to intervene on the club's behalf and ask the FCC chairman to grant an exception. Mr. Untermeyer agreed and asked Al Brown to draft a letter for him to sign, which was sent to Alfred Sikes, chairman of the FCC, in March.

In his reply, Mr. Sikes states that considering the importance of the 50th anniversary of the Voice of America and that other governments around the world have issued VOA-suffix callsigns, "I have asked . . that Rule 97.17(f) be waived and that the VOA headquarters amateur radio station be issued a `VOA-suffix' callsign."

The license of the new callsign K3VOA was mailed from the FCC office in Gettysburg, Pennsylvania, on May 7th.

To our knowledge, this is the first time since the adoption of FCC Rule 97.17(f) that a waiver has been granted. The rule really dates back to the early 1970s when it was fairly common for the FCC leadership to reward distinguished amateurs and notable organizations with preferential call letters at no cost. *TNX W5YI Report, Volume 14, Issue #11, June 1, 1992.*

Has UPS Given Up on 220?!

It appears as if United Parcel Service has changed its mind about developing an all-AC-SSB voice and data network in the newly reallocated 220-222 MHz band. On May 14, the *Tulsa World* (Oklahoma) newspaper reported that UPS had entered into an agreement with GTE, McCall, Pac-Tel and Southwestern Bell to use cellular telephone frequencies for data communications between its five thousand trucks and their offices.

A United Parcel spokesman was quoted as saying: "We have the fleet. We have worldwide computer communications. And now, we link it all together as the first cellular data network."

Amateur radio operators in the Tulsa area and elsewhere are now wondering if this means that United Parcel Service has abandoned its well-publicized plans to use the lower two megahertz of the former 220-225 MHz amateur band for their corporate wide communications network. *TNX Mike Reynolds WØKIE and Westlink Report, Number 627, June 15, 1992.*

VECs Hold Annual Conference on Ham Testing

Volunteer Examiner Coordinators representing more than 98% of all amateur radio operator license examinations conducted in the amateur service met on June 11 and 12 in Gettysburg, Pennsylvania, at their annual conference. Several FCC officials and 12 out of 18 VECs were present at the meeting.

In his opening remarks, Personal Radio Branch Chief John B. Johnston congratulated the VEC System for efficiently coordinating 41,000 exam sessions, examining 477,000 applicants and administering 777,000 test elements in its nine years of operation since 1984. "That is a record for which you should be very proud."

Johnston, and later Private Radio Bureau Chief Ralph Haller, both licensed amateurs, covered many items of general interest to the ham community. Johnston pointed out that the Technician class has become the entry level of choice. He also told attendees that: "In spite of the additional work you've been doing, you have been able to actually improve on quality. The defective applications (0.4%) were the best ever. You are doing a good job. And this is very important because an error on an application hurts everyone. There are labor costs to correct that error. Labor that should be spent on providing a faster speed-of-service must be diverted to obtaining the correct information for that defective application. It delays the processing of all licenses . . . and it delays the newcomer from getting on the air."

Johnston also noted that: "Your system is far superior to the previous [FCC] system. There are many more locations where examinations are administered. . . . Your system is superior in terms of the days of the week exams are administered. Exams can be taken on the weekends and in the evenings. Your VEs solved the problem of limited opportunity.

"There is a big improvement in the questions. We were never able to keep the written exams current with the rules or with your state-of-the-art. We never were able to provide enough different code tests. Our exams were always compromised the very first time they were used."

Johnston also discussed the Technician Plus data base, rulemaking and the question pools, voluntary and involuntary retesting, and handicapped code credit.

Ralph Haller said that the FCC is looking into a program of "auto grant" 24-hour licensing turnaround through electronic filing. The goal is paperless communications with Gettysburg. The requirement that the FCC actually see a written signature on the Form 610 application will be eliminated under a new amendment to FCC Authorization legislation now in process. Actual signatures would be kept with the VEC."

Haller also said there would be a proceeding issued shortly that would relax the "no business" communications rule. *TNX W5YI Report, Volume 14, #12, June 15. 1992.*

Revised Form 610 Amateur Application Issued

The FCC's Forms Distribution Center has received a large shipment of revised "Application for Amateur Radio Station/Operator License," Form 610. It carries an issue date of March 1992 although it has just recently been received at the forms warehouse.

The form is now being printed on goldenrod rather than buff colored paper. It is the first revision in more than two years and carries an expiration date of February 28, 1995. It is six pages long due to four pages of instructions. Here are some of the changes:

(1.) The new form now includes the *Physician's Certification of Disability* and *Patient's Release* needed for handicapped 13/20 wpm telegraphy exemption. It is no longer necessary to submit another form with the application to obtain a handicapped telegraphy exemption. VEs are instructed to write in the letter "H" in the Administering VEs Report in Item C under Element 1C.

(2.) Applicants are now required to initial all requests for a callsign change. (Section I, Line 2E.)

(3.) Section I, Line 6 (Date of Birth) now has hyphens (rather than slant bars) to eliminate the possibility that the slant bar might be mistaken for the figure "1." Instructions now require that two figures be placed in each of the month, day and year spaces. For May 1, 1947, write in 05-01-47 (not 5-1-47).

These forms are available from the FCC's Forms Distribution Center by leaving a message on the phone (202/632-FORM). *TNX W5YI Report, Volume 14, Issue #11, June 1, 1992.*

TNX . . .

. . . to all our contributors! You can reach us by phone at (603) 924—0058, or by mail at *73 Magazine,* Route 202 North, Peterborough NH 03458. Or get in touch with us on CompuServe ppn 70310,775; MCI Mail "WGEPUB"; or the 73 BBS at (603) 924—9343 (300—2400 bps), 8 data bits, no parity, one stop bit. News items that don't make it into *73* are often put in our other monthly publication, *Radio Fun.* You can also send news items by FAX at (603) 924—9327.

Number 4 on your Feedback card

The ViewPort VGA Color SSTV System

At last—a versatile slow-scan TV program and interface for the IBM PC.

by J. R. Montalbano KA2PYJ

A ROBOT compatible color SSTV system for the IBM PC has been long awaited. The lack of affordable display controller boards capable of displaying more than 16 colors has made such a system unfeasible. This situation is changing as the cost of display controllers capable of displaying more than 32 thousand colors is dropping below $160. At the 1992 Dayton HamVention, I demonstrated an IBM compatible SSTV system which can send and receive air-worthy SSTV pictures using an inexpensive hardware interface and a computer equipped with one of these standard displays. To date, over 100 hams are enjoying SSTV using a system I call ViewPort VGA. This article describes the hardware and software of that system.

Photo A. The ViewPort VGA interface allows you to receive and transmit color SSTV with an IBM PC or compatible.

Hardware Requirements

The hardware interface is a modified version of John Langner's (WB2OSZ) interface to the Atari ST (*73 Magazine*, December 1989 and January 1990). That board was designed to connect to a high-speed serial port on the Atari computer. The PC does not have a fast enough serial interface, so I modified the board to connect to the PC's printer port. Figure 1 shows the station configuration for the system.

The software has been tested on systems ranging from a 4.77 MHz XT to a 33 MHz 386. The hardware interfaces to LPT1 at address $378 or LPT2 and address $278. You will need at least 640K of memory. This system requires a VGA board that can display 256 colors at 320 x 200 resolution. The software also supports the latest HiColor™ VGA display adapters. These are capable of displaying 32,768 colors on your VGA screen. The results are excellent.

Compatibility With Existing SSTV Modes

Many new slow-scan television formats have been introduced since the early days of eight-second B/W transmission. Each has its own advantage in terms of resolution, transmission time and noise immunity. The mode names usually identify their inventors, followed by a reference to the transmission speed in seconds (e.g. ROBOT 72 or AVT 94). A computer-based system such as this offers the potential for compatibility with all of the modes since the format decoding is done in software. At the time of this writing, the software supports the most popular ROBOT modes (see Table 1). You will be able to receive about 80% of the pictures transmitted on the popular SSTV operating frequencies. A version to support the European B/W and Wraase modes is being tested and will be available soon. Other modes may be added in the future.

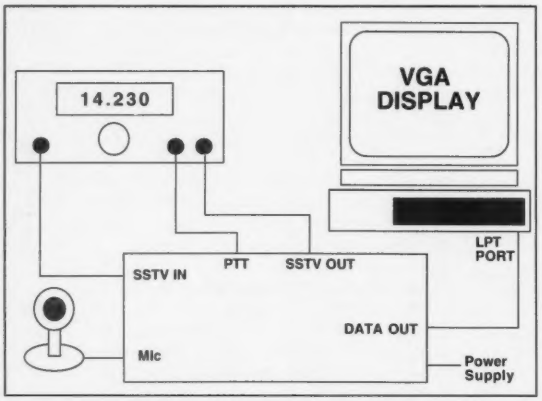

Figure 1. ViewPort VGA station configuration.

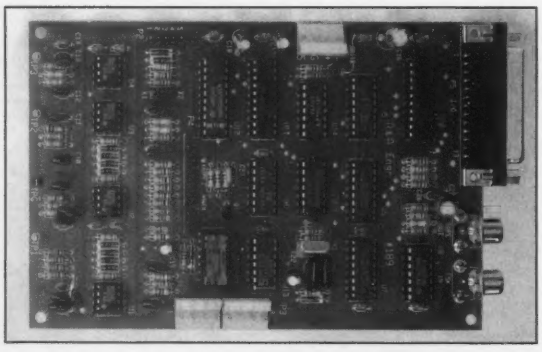

Photo B. The SSTV interface board.

Slow-Scan Demodulator

The demodulator is similar to the one presented in "Color Computer SSTV," by K6AEP and WB8DQT, in the November and December 1984 issues of *73 Magazine*. The demodulator converts the FM-modulated slow-scan audio signal into an amplitude-modulated video signal. This AM video signal is converted to digital format by an A/D converter where it can be read by the PC through a printer port. The computer interprets the digital signals from the A/D to produce the correct display on the computer monitor.

The slow-scan audio signal is first amplitude-limited by U1b. The square wave output of U1b drives two bandpass filters built around U1a and U2b. One of these (U2b) has a center frequency of about 1200 Hz and the other (U1a) has a center frequency of about 2300 Hz. When the outputs from these filters are rectified and summed out of phase by U2A, the result is an amplitude-modulated audio signal. The bandpass filters built around U3a, U3b and U4b pass only the video components below 950 Hz. RO and RV set the offset and gain of U4 to produce a zero volt DC at TP-3 with 1200 Hz input frequency and 5 volts DC with a 2300 Hz input signal.

Figure 2 shows the waveform present at TP-3 when a five-step grayscale signal is input to the demodulator. The clock input of the A/D (U12) is strobed at a rate controlled by the software. Each time U12 is strobed, an 8-bit word is output at D0-D7, which represents the amplitude of the waveform at TP-3 at that instant. U12 outputs Hexidecimal $00 for 1200 Hz (sync),

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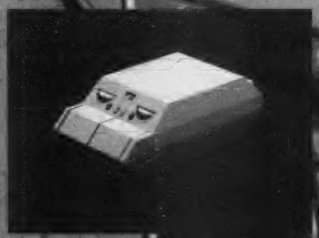

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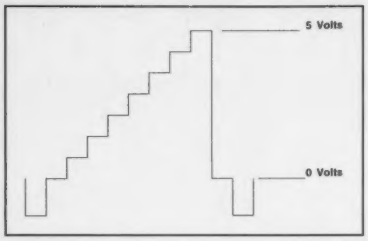

Figure 2. Waveform at TP-3 with gray-scale input.

$46 for 1500 Hz (black) and $FF for 2300 Hz (white). Video levels between black and white are represented by 8-bit values between $46 and $FF. U11 multiplexes the 8-bit output of the A/D into two 4-bit nibbles so that this data can be input to the four status input bits available on any standard Centronics printer interface.

Slow-Scan Modulator

The modulator is a modern digital design that never requires adjustment. The time base for the circuit is a 4 MHz crystal (X1). U5 and U6 are a divide-by-n counter which is programmable by the PC through bits PD0-PD7 on the printer interface. U7, U8 and R42-R44 produce a sine wave output whose frequency is 250,000/(256-n), where "n" is the 8-bit value presented on PD0-PD7 by the computer.

When both PD6 and PD7 are high, K1 opens and the interface is in the receive mode. When either RD6 or RD7 are low, relay K1 energizes to key the rig and to connect the modulator output to the rig's audio input.

The circuit built around U13 prevents the interface from entering the transmit mode when the PC initializes the printer port during power up. The QD output is cleared at power up, or when the interface is in the receive mode. The software strobes U13-4 eight times to enable the transmit mode.

Construction

Several point-to-point and wire-wrapped prototypes have been built successfully. Alternately, a PC board and/or a complete kit of parts is available from A & A Engineering (2521 W. LaPalma, Unit K, Anaheim CA 92801; (714) 952-2114, see the Parts List for details). A 25-pin D-SUB connector is used for the interface-to-printer port connection. A microphone connector is used to connect audio and PTT to your rig. In addition a +/-12-volt 100 mA and a 5-volt 300 mA power supply are required.

Alignment

Connect the interface to your computer's printer port. You must change the LPT: parameter in SSTV.CFG to LPT:2 if you connect the interface to LPT2. Connect the modulator's tape output to the demodulator input with a jumper wire. Select the Loopback function from the SETUP menu (see Photo G). This causes the modulator to produce a sequence of 1200 Hz, 1500 Hz, 1900 Hz and 2300 Hz tones. The program reads the resulting values from the A/D converter and displays them graphically. Adjust RO and RV until the indicators line up with the corresponding arrow heads. The indicators for the sync and white levels should just reach the0 and 255 arrows. If you go beyond those points, you may not be able to set the 1500 and 1900 Hz levels correctly. Press the space bar to momentarily pause the program. The values displayed on the right side of the screen should be within +/- 4 of 0 70, 164 and 255.

{NOTE: Those of you fortunate enough to have 486 machines will need to switch them out of the turbo mode when running the loopback program.}

Operation

The user interface is quite simple since it was designed for single keystroke operations. There are four menus in the current software (Photos D–G). Switch between the RECEIVE and TRANSMIT menus by pressing "r"

Photo C. An actual received image using the ViewPort VGA SSTV system.

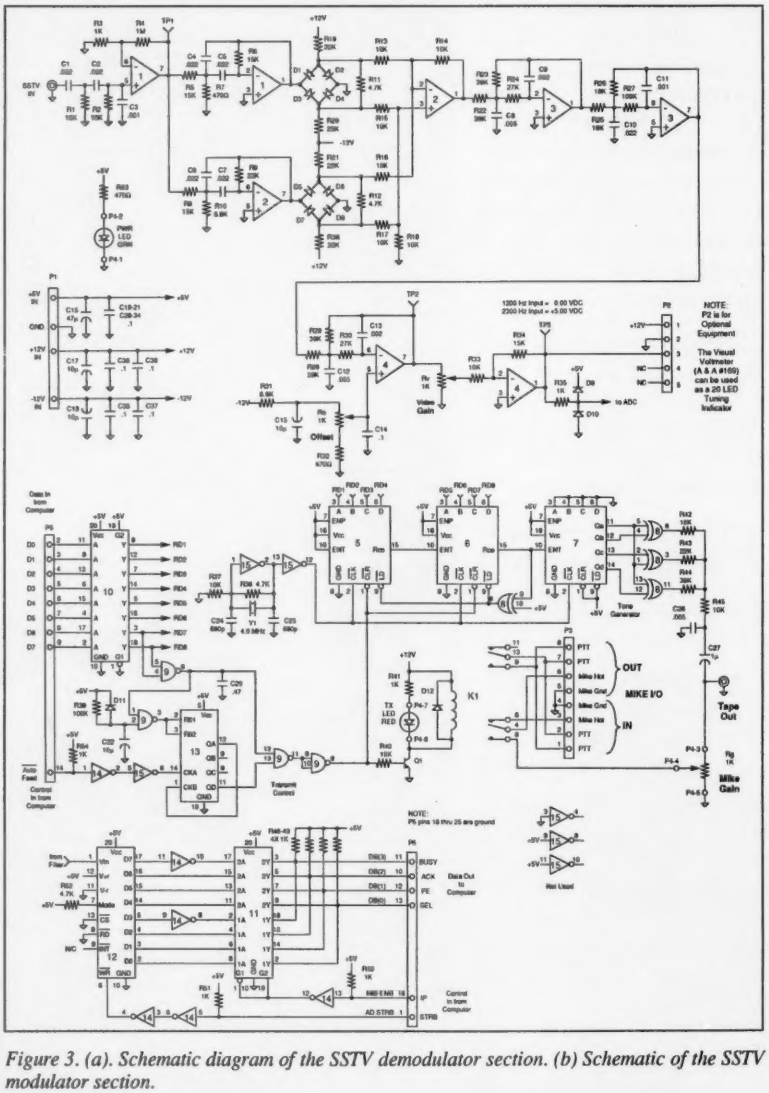

Figure 3. (a). Schematic diagram of the SSTV demodulator section. (b) Schematic of the SSTV modulator section.

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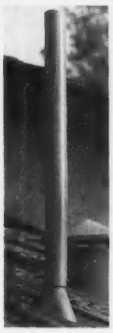

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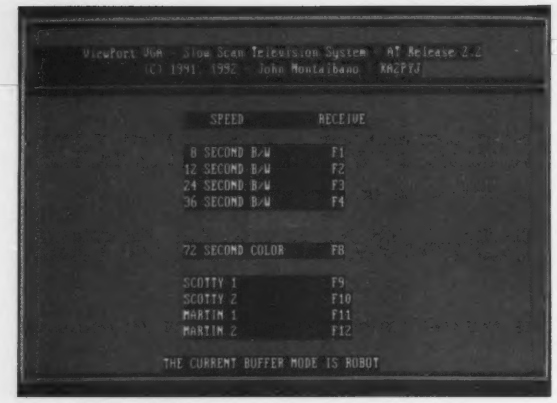
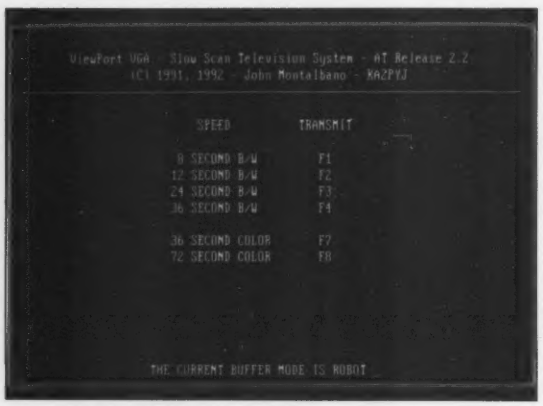

ViewPort VGA - Slow Scan Television System - AT Release 2.2
(C) 1991, 1992 - John Montalbano - KA2PYJ
SPEED RECEIVE
8 SECOND B/W F1
12 SECOND B/W F2
24 SECOND B/W F3
36 SECOND B/W F4
72 SECOND COLOR F8
SCOTTY 1 F9
SCOTTY 2 F10
MARTIN 1 F11
MARTIN 2 F12
THE CURRENT BUFFER MODE IS ROBOT

Photo D. The Main menu of the SSTV program.


ViewPort VGA - Slow Scan Television System - AT Release 2.2
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SPEED TRANSMIT
8 SECOND B/W F1
12 SECOND B/W F2
24 SECOND B/W F3
36 SECOND B/W F4
36 SECOND COLOR F7
72 SECOND COLOR F8
THE CURRENT BUFFER MODE IS ROBOT

Photo E. The Transmit menu of the SSTV program.

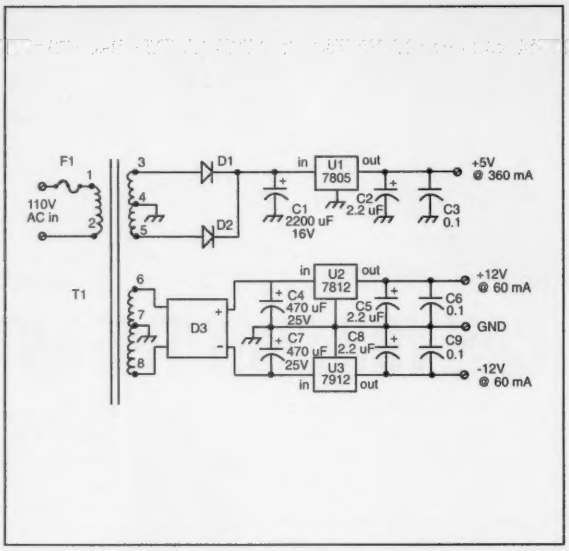

Figure 4. Power supply schematic diagram.

or "t." Press "escape" to bring up the ADDITIONAL FUNCTIONS menu from which you can load and save pictures to disk. The SETUP menu can be accessed from the ADDITIONAL FUNCTIONS menu. Pressing "q" at any menu terminates the program.

Receive Mode

Modern SSTV transmission formats include a digital header called a Vertical Interval Signal (VIS) to indicate to the receiver the mode being sent. The current software does not support the VIS in the receive mode. Courteous SSTV operators will also identify the mode by voice before transmission. Listen for the sending station to send two short tones which signal the start of a picture. Press the appropriate function key to begin reception. Press any key during reception to abort.

The program uses the VGA's 320 pixels by 200 lines display mode. Modes that use 128 pixels by 120 lines are displayed in full. Modes with more than 200 lines will be received in full, but only the first 200 lines will be displayed. When the transmission is complete, press any key to return to the main menu (see Photo D). The received picture disappears from the screen, but is saved in memory. Press ENTER to re-display the picture. This time, the software "tosses out" every sixth scan line so that the entire picture fits on the 200 line display.

While receiving, the program displays the picture with a default palette of colors selected from 256 thousand possible choices. Although this produces reasonably good pictures, you have the option to do some image processing to improve them. Press ESC to enter the Additional Functions Menu (see Photo F). Save the picture to disk. You will be prompted for a file name. After the file is written, selecting CUSTOM COLOR PALETTE LOAD invokes an image processing function which analyzes the picture to make a better selection of 256 colors with which to represent the picture. Enter the file name of the picture previously saved to disk. The routine takes about 30 seconds on a 20 MHz 386, so be patient. When the routine finishes, it will display the improved picture. There is no need to save this version of the picture since it is already saved with 32K color resolution.

You should be aware that since the VGA can display only 256 colors, a small error in frequency can result in a large error in color. The received picture will usually be too pink or too green if you are off frequency. A scope connected to TP3 makes a convenient tuning indicator. While receiving a slow-scan signal, tune the rig so that the tips of the sync pulses are at zero volts. With practice, you will learn to tune in pictures without using the scope. Some stations now have the capability to send a constant 1200 Hz tone. While in the RECEIVE menu, pressing "+" will produce 5 seconds of 1200 Hz audio from your PC's speaker. Use this tone to zero beat the received tone.

While in the TRANSMIT menu (see Photo F), pressing "+" will send 5 seconds of 1200 Hz against which other stations can zero beat their locally generated 1200 Hz tone.

You should also be aware that the ROBOT modes are susceptible to noise. In particular, when noise occurs during a sync pulse, the software might skip an entire scan line of the video. Noise which occurs during a scan line gets translated into video and typically appears as "snow." I have received "closed circuit" pictures with S-7 to S-9 signals and a noise level of about S-3. Keep in mind that the overall signal to noise ratio is more important than the signal strength.

Transmit Mode

Most SSTV operators using commercial equipment have a video capture device with which to digitize their own pictures. There are many such devices available for the IBM PC ranging in price from $89 to $3,000. The least expensive boards can digitize monochrome video only. Each frame takes several seconds to digitize, so the subject must remain very still. This type of board is referred to by slow-scanners as a "digitizer." Creative SSTV operators have learned to use digitizers to produce color pictures by using color filters in front of the camera lens and then mixing red, green and blue frames to make a composite color picture.

The more expensive devices ($350 and up) accept an NTSC video signal from your color camera or VCR and digitize a frame in 1/30 of a second. These are referred to as Real Time Frame Grabbers. These are more appropriate for digitizing live subjects such as yourself proudly posed in front of your hard-earned ham equipment. Some examples of digitizers are: Colorburst, Ventek and Digital Vision Computereyes. [*Ed. Note: See this month's ATV column for a discussion of video digitizers.*]

Either type of device will usually come with software which controls the digitization and storage to disk of pictures. These usually store the digital picture in a common image file format such as GIF, PCX or TGA. ViewPort VGA

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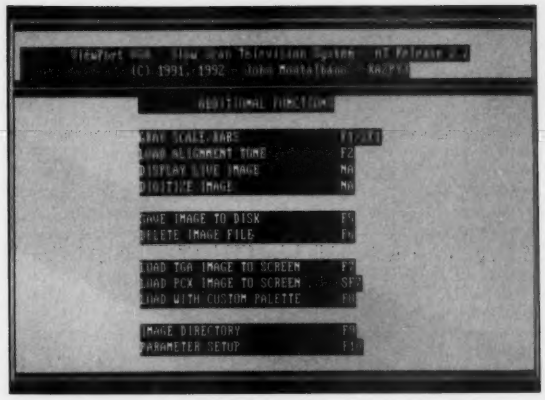

Photo F. The Additional Functions menu.

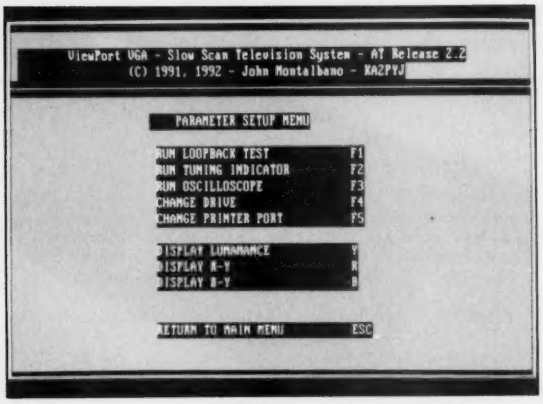
ViewPort VGA - Slow Scan Television System - AT Release 2.2
(C) 1991, 1992 - John Montalbano - KA2PYJ
PARAMETER SETUP MENU
RUN LOOPBACK TEST F1
RUN TUNING INDICATOR F2
RUN OSCILLOSCOPE F3
CHANGE DRIVE F4
CHANGE PRINTER PORT F5
DISPLAY LUMANANCE Y
DISPLAY R-Y R
DISPLAY B-Y B
RETURN TO MAIN MENU ESC

Photo G. The Parameter Setup menu.

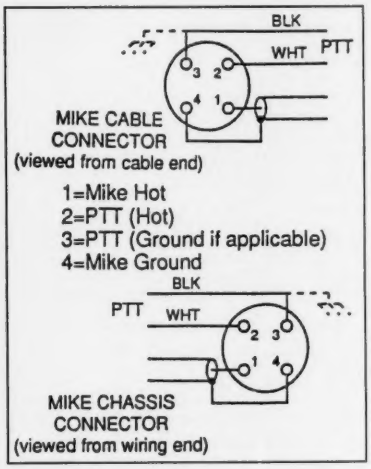

Figure 5. Microphone jack wiring to the SSTV interface.

version 2.4 software supports the 256 color PCX and 32K color TGA file formats.

If you do not own a video camera or frame grabber, you can find thousands of pictures stored in the GIF™ file format on computer bulletin boards and sold on floppy disks at hamfests. Use only the ones made for 256 color VGA displays. These are usually high quality pictures and offer a wide variety of subject matter. Use a program such as VPIC to convert the GIF format to PCX format. This will usually produce files with resolutions beyond the 256 x 240 SSTV format. Use a program such as Zsoft's PC Paintbrush (256 color version) or Alchemy Mindworks Graphic WorkShop to scale 640 x 480 images to 256 x 240 pixels or 320 x 200 images to 256 x 200 and save them as a PCX files.

Press ESC to bring up the Additional Functions Menu. Load a picture file. Enter the file name at the prompt. The picture will be loaded in full 32K color resolution and displayed on the screen in 256 colors. Press any key to return to the main menu. Announce to the receiving station (and to the dozens of others who are "just listening in") what transmission mode you will be using. Now select that mode by pressing the appropriate function key. The software will send the VIS code for that mode, followed by the picture. The menu will indicate what mode you are transmitting in. Press any key during the transmission to abort.

Improve Your Image With ViewPort 32K

Many hams are enjoying ViewPort VGA on their standard 256 color VGA adapters. Others have upgraded to the HiColor VGA boards which display received pictures with full-color resolution. ViewPort 32K supports HiColor VGA boards manufactured by Swan Technologies, United Solutions and Diamond SpeedStar. I recommend the Diamond SpeedSTAR HiColor board since it is shipped with a copy of WinRIX, a very powerful picture editing and titling program which runs under Microsoft Windows. ViewPort 32K software is enabled by setting the HICOLOR parameter in the file called SSTV.CFG to HICOLOR:1.

Pictures are displayed with 256 colors as they are received. Pressing the enter key at the end of the transmission causes the picture to be repainted instantly using 32,768 colors.

Comments

ViewPort VGA is the result of hundreds of hours of experimentation, programming and on-air testing on my part. I owe many thanks to John Langner WB2OSZ who inspired me to take on this project and who openly shared his experience with the Atari version of the system. Special thanks to Johann N5CST whose 20 over 9 signal was my SSTV test generator into the

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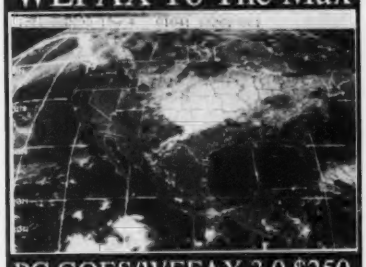

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R3,R35,R41,R46,R47, R48,R49,R50,R51,R54	1k resistor
R4	1 MEG resistor
R5,R6,R8,R34	15k resistor
R7,R32,R53	470 ohm resistor
R9,R19,R20,R21,R36,R43	22k resistor
R10,R31	6.8k resistor
R11,R12,R38,R52	4.7k resistor
R22,R23,R28,R29,R44	39k resistor
R24,R30	27k resistor
R25,R26	18k resistor
R27,R39	100k resistor
Rg	1k panel mount potetiometer
Rv, Ro	1k/15 turn vertical mount PCB potentiometer
C1,C2,C4,C5,C6,C7,C10	0.022 uF mylar capacitor
C3	0.001 uF ceramic disc capacitor
C8,C12,C26	0.005 µF mylar capacitor
C9,C13	0.002 µF mylar capacitor
C11	0.001 µF mylar capacitor
C14,C19,C20,C21,C28-C38	0.1 µF mono capacitor
C15,C17,C18,C22	10 µF radial electrolytic capacitor
C16	47 µF radial electrolytic capacitor
C23	0.47 µF mono capacitor (474)
C24,C25	680 pF disc capacitor
C27	1 µF radial capacitor
D1-D12	1N4148 diode
Q1	MPSA13 transistor
Y1	4.000 MHz crystal
U1,U2,U3,U4	LM1458 IC
U5,U6,U7	74LS161 IC
U8	74LS86
U9	74LS00
U10,U11	74LS241
U12	ADC0820
U13	74LS93
U14	74LS14
U15	74LS04
K1	12 VDC relay
P1	4-pin 0.156" header
P2	5-pin 0.100" header
P3	8-pin 0.156" header
P4	7-pin 0.100" header
P5	25-pin PCB female D (computer I/O)

Optional Power Supply

C1	2200 µF/16V radial electrolytic
C4,C7	470 µF/35 V radial electrolytic
C2,C5,C8	2.2 µF radial
C3,C6,C9	0.1 µF disc ceramic
D1,D2	1N4004 diode
D3	200V @ 1A, WO2M (or WB152) diode bridge
U1	7805T
U2	7812T
U3	7912T
T1	28 VCT @ 140 mA & 9V @ 0.5A, MPC-X-12 power transformer (or A&A 110-X-12)
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Board level kit without the case or mounting hardware
#189-KIT $129.95

Blank SSTV PC board
#189-PCB $19.95

Blank power supply PC board
#133-PCB $7.95

6-foot, 25-pin male to male cable
#6-25-MM $10.00

Shipping/insurance is $5 additional per order. California residents please add 7.75% sales tax.

wee hours of many a late night, and to W3LDS, WB2YRH, WB4OQ, K4FJK, N4TZJ, KF4ZC, WA3YAH and KA8LWR who wired and tested the first prototypes.

I hope that this project allows many of you to participate in this exciting operating mode. As a courtesy to stations that operate in other modes, SSTVers try to restrict their operations to 3.845, 7.181, 14.230, 14.233, 21.340 and 28.680 MHz. Hence, you will find it very easy to make a contact at almost any hour of the day on these frequencies. Please keep in mind that there are often dozens of stations listening in and patiently waiting their turn to send a picture or to receive others'. Please exercise your best operating practices so that we can all continue to enjoy this fantastic hobby. "See" you on the radio!

Using the ROBOT 400 for Color Receive

Owners of the once popular ROBOT 400 B/W scan converter will be happy to know that they can upgrade the ROBOT 400 to receive color pictures on a PC with VGA display for about $20. Figure 6 is a schematic of that interface. The audio input to this circuit is connected across the Receive Contrast control on the 400. The ROBOT 400 provides all the necessary power supplies.

To modify the ROBOT, remove the cover and unplug the main circuit board. You'll find plenty of room in the bottom of the ROBOT unit to mount the interface circuit shown in Figure 6. There is a terminal strip inside of the 400 where you can tap into 5 volts and +/- 12 volts for the interface circuit. When you mount the circuit in place, make sure you have the RO and RV pots positioned so that you can reach them with a tuning tool through small holes in the ROBOT. Tap the interface circuit onto the "hot" lead of the Receive Contrast control on the 400 as shown and run a ribbon cable out of the ROBOT between the chassis and the case over to your computer's parallel port. If you want a fancier installation, you may want to mount a DB-25 connector on the back of the ROBOT. Then just reinstall the ROBOT main PC board and power it up.

To adjust the ROBOT interface circuit, send a 1200 Hz tone into the audio input and adjust potentiometer RO for 0 volts as measured at test point TP3. Then send a 2300 Hz tone and adjust potentiometer RV for a reading of 5 volts at TP3. Since there is some interaction between the two adjustments, you will have to repeat these two steps until you achieve the final results. Now just run the ViewPort software and you have an inexpensive, but powerful, color SSTV receive system.

SSTV Nets

IVCA	Sat. 1500 UTC, 14.230 MHz
North American	Sat. 1800 UTC, 14.230 MHz
South American	Wed. 2300 UTC, 14.236 MHz
European	Sat. 1300 UTC, 14.233 MHz
South Pacific	Sun. 0400 UTC, 14.247 MHz

Parts Availability

ViewPort VGA Release 2.4 is shipped by A & A Engineering with the purchase of a bare board or kit. ViewPort VGA software is not copy protected so that it can be made easily available to you through bulletin boards and other hams. KA2PYJ requests a registration fee of $12 from users of the software. The ViewPort software is also available from the *73* BBS at (603) 924-9343. If you don't have access to a modem, you can send $12 directly to the author for a copy of the latest version, please indicate your disk format.

For the latest version of VPIC, send $20 to: Bob Montgomery, 543 Via Fontana #203, Altamonte Springs FL 32714-3172.

For the latest version of Graphic Workshop, send $40 to: Alchemy Mindworks, Inc., P.O. Box 500, Beeton Ontario L0G 1A0, Canada.

HiColor is a trademark of Sierra Semiconductors.

Diamond Computer Systems (Model-Diamond Speedstar HC), 532 Mercury Drive, Sunnyvale CA 94086. Phone: (408) 736-2000.

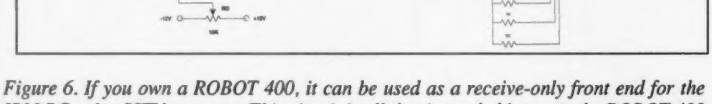

Figure 6. If you own a ROBOT 400, it can be used as a receive-only front end for the IBM PC color SSTV program. This circuit is all that is needed between the ROBOT 400 and the IBM PC parallel port for proper operation.

Table 1. Slow-Scan Formats Currently Supported

Format	Color/BW	Resolution	Comments
8 sec.	B/W	128 x 120	Send & receive
12 sec.	B/W	128 x 120	Send & receive
24 sec.	B/W	256 x 240	Send & receive
36 sec.	B/W	256 x 240	Send & receive
72 sec.	Color	256 x 240	Send & receive
36 sec.	Color	256 x 240	Send & receive
S1	Color	256 x 256	Receive only*
S2	Color	256 x 256	Receive only*
M1	Color	256 x 256	Receive only
M2	Color	256 x 256	Receive only

*Software to transmit in these modes is being tested and will be available from KA2PYJ soon.

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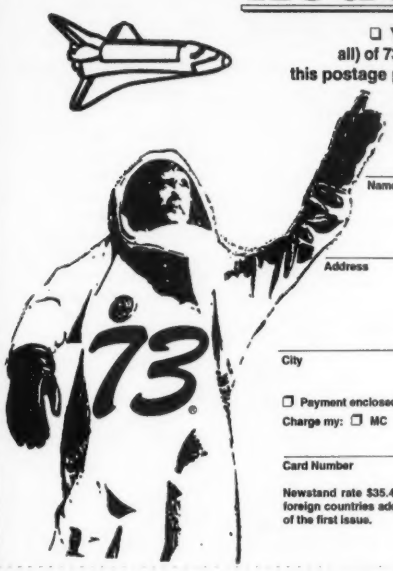

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10 Review: Larsen KG 2/70 Glass-Mounted Antenna
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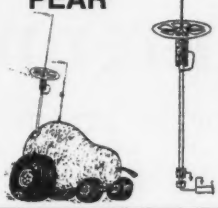

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The Compact-A-Loop Antenna

80 meters for the apartment dweller.

by Richard Q. Marris G2BZQ

Many of us dream of a super all-band antenna farm. There is nothing wrong with this dream if you have the odd acre or two of real estate way out in the sticks. Good luck to those fortunate few. Many of us will have to rely on an unexpected windfall to provide the necessary shekels to achieve this dream. However, while waiting for the windfall, amateur transmitting life must go on. Many hams suffer from lack of space, from official and other diabolical restrictions, and often from a poor ground. The best idea is to design/tailor-make the best possible antenna to fit the existing space available. Such is the Compact-A-Loop.

I designed the Compact-A-Loop by experimenting with various 80 meter band horizontal loop configurations not needing any RF ground. It fits into a room with the transmitter located on a desk in the corner, and is easily adaptable for outdoors space.

Figure 1 shows the final Loop circuit, which is a horizontal delta shape with a 42' circumference (3' x 14' sides). The Loop can be resonated via a 2-gang variable capacitor (C3 and C4), and covers the whole 80 meter band (3500-3800 kHz). In parallel are ballast capacitors C2 and C5 (discussed later in this article). Connection to the 50 ohm impedance feedline is via C1, which is a coupling/matching capacitor. The usable bandwidth, without retuning, on the prototype is approximately +/-20 kHz of selected frequency. I tried other horizontal loop shapes, including square, rectangular, and some very irregular multisided shapes. The frequency range changed in all cases, and the bandwidth was narrower, down to +/-3 kHz in one case. Furthermore, to add to the complexity, the proximity of nearby objects affected both frequency range and bandwidth. Extensive experiments indicated that the final delta shape was way ahead of the other shapes. One very obvious reason for this is that it is possible to keep all 3' x 14' long sides well away from the walls (see Figure 2) and other objects. This gave the best usable bandwidth, best transmitter loading and range, and best received signals. Low RF power output of 7 or 8 watts CW was used in all tests, and is used in operation. No harmonic radiation or TVI was detectable.

The Loop is omnidirectional with a useful forward "hump" on B around the junction of B and C. Figure 2 shows how this "hump" has been oriented approximately east southeast,

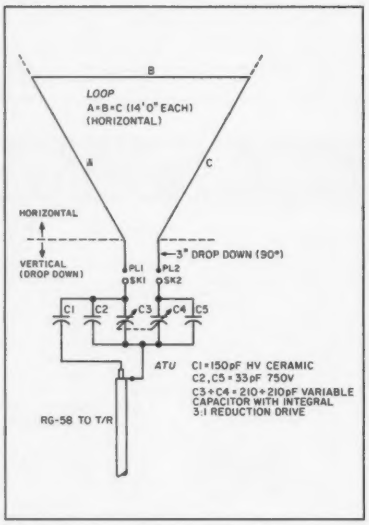

Figure 1. Diagram of the Compact-A-Loop.

giving a small peak right across Europe and well into the USSR. Ideally, this small peak should point westward to get maximum signals to North America, but this was not possible here. Apart from this small peak, the Loop is omnidirectional.

Construction

The Loop consists of 42' of white stranded #20 PVC covered wire This is quite adequate for low power operation. You may want to use larger diameter wire for higher power outdoor operation. The Loop was erected with three equal sides (A + B + C). It is held 10" below the ceiling, and is supported by lengths of 8 lb. breaking strain nylon fishing line which, along with the white PVC wire, is inconspicuous against a white ceiling. Figure 4 shows a space-saving compressed version, still using 42 feet of wire (discussed later).

The ends of A and C are dropped down 3" (Figure 2) and fitted with 4mm plugs (PL1 and PL2) to plug into the top of the tuning unit (Figure 3).

The Tuning Assembly

The tuning unit (Figures 1 and 3) is somewhat unusual. It is assembled into a plastic box raised from the operating desk by a vertical post so that the top is just below the apex of the loop, which plugs into sockets SK1 and SK2. A 1/4" (6mm) diameter wood dowel remote control shaft drops down so that the control knob is conveniently reached by just raising your left hand a few inches off the desk. The resonating variable capacitor (C3 and C4) is a 2-gang 210 + 210 pF with integral 3:1 reduction drive. An alternative would be to use another make and fit an external slow motion drive. C2 and C5 are 33 pF (750 volt) silver mica ballast capacitors, selected to ensure that the 80 meter band is fully covered. Alternative values, up to +/-15 pF, may be required if the Loop configuration is changed in shape. The frequency range may be affected slightly by the proximity of surrounding objects.

Coupling/matching capacitor C1 is a 150 pF ceramic (1 kV). It couples one end of the Loop to 5 feet of RG58 coaxial 50 ohm impedance feedline, which exits through a hole in the rear of the box, and is cleated at the back of the vertical post, down to the transmitter/receiver. In original tests C1 was a 250 pF variable capacitor—however, I found that 150 pF (on the VC) was optimum and not critical, so a fixed capacitor was substituted.

The tuning unit layout is shown in Figure 3a, and the actual mounting used here is in Figure 3b. The mounting can be adapted to suit individual requirements. If the Loop is erected in a loft or outdoors, a remote tuning arrangement will have to be devised. If the Loop is erected outdoors, it should be possible to put the tuning unit just inside a window. The plastic box I used had a metal panel which was replaced with a small piece of plastic sheet.

Operation and Results

The resonating capacitors C3 and C4 are tuned for maximum signal on "receive" at the desired frequency. For example, here it is often resonated at 3550 kHz, giving a usable range of 3530-3570 kHz without retuning C3 and C4. The transmitter is loaded into a dummy 50 ohm load in the usual way. On "transmit" with the Loop connected, only a very minor adjustment of C3 and C4 and transmitter loading may be needed—if at all. The frequency range can rapidly be achieved by adjusting C3 and C4.

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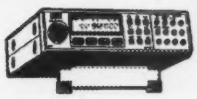

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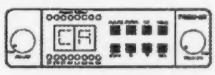

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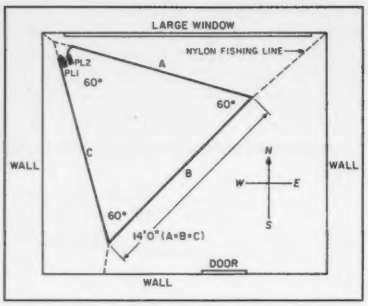
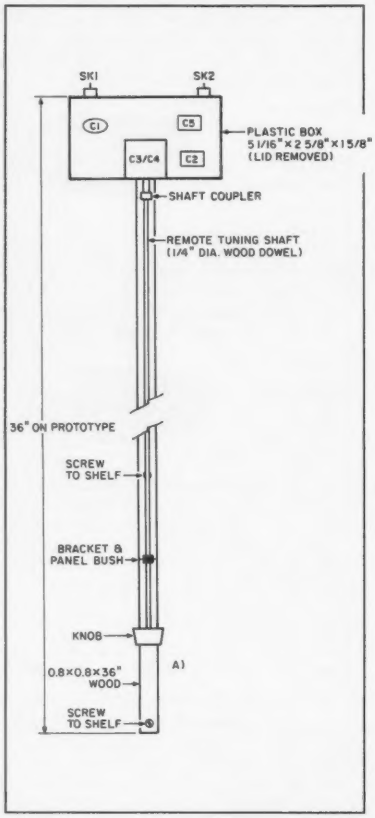


Figure 2. Installation of the Loop.



Parts List

C3, C4	210 + 210 pF	2-gang variable capacitor with integral 3:1 reduction drive
C2, C5	33 pF 750 volt	Silver mica capacitor (see text)
C1	150 pF 1 kV	Ceramic disc
Loop	A+B*C is 42 feet of white #20 PVC covered stranded wire (larger diameter wire is advisable for outdoor installations.).	
PL1/PL2	4mm	Banana plugs
SK1/SK2	4mm	Banana sockets
Box	Plastic box 5-1/16" x 2-5/8" x 1-5/8" Tandy (Radio Shack), (120 x 65 x 40 mm), Cat. No. 270-233 Metal lid replaced (see text)	
Feedline	RG58 coaxial	Approx. 60" used
Tuning	1/4" (6mm) wood dowel to required length	
Shaft	(36" used on prototype) + shaft coupler + bracket and panel bush and knob	

bad. It was immediately answered by a station about 1,000 miles away. Though his signal was very weak, he gave an excellent report. Subsequent operating results were quite excellent between 0300 and 0500, several mornings per week.

Let me stress that this Loop, as described, is a low-power antenna for indoor use. *High power, indoors, can be dangerous and may be lethal.* If the Loop is erected outdoors, then higher power can be used. The wire gauge should be increased, and possibly higher voltage rating capacitors should be used.

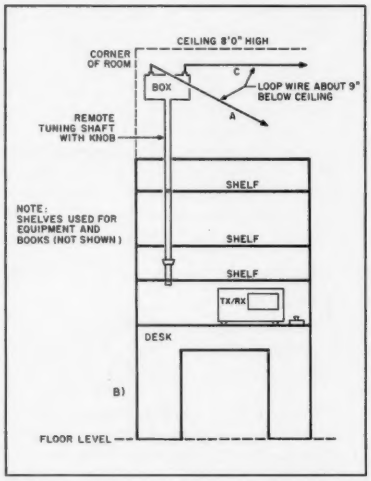


Figure 3. a) Tuning unit (with remote tuning shaft). b) Configuration used on the prototype.

Ideas

The results obtained with the configurations shown in Figures 1 and 2 indicate that the high voltage points are on Loop arm A; B and C give maximum radiation. It is well worth trying a reversal of PL1 and 2 in SK 1 and 2.

During experiments I tried a compressed version of the Compact-A-Loop (see Figure 4). The effective area taken up by the Loop was reduced by about 20/25%. Various angles were tried (AB) from 45 to 70 degrees. The usable bandwidth was about +/-15 kHz and an extra 15 pF was added to C2 and C5. This was still a very usable antenna.

I didn't try this Loop on other bands, but you would have little difficulty in adapting the design for this purpose.

Conclusion

This Loop antenna is a very useful, efficient, low-power device for the TXer with restricted space who wants to work on the 80 meter band. It is low cost, quick to erect, and has very obvious potential for the experimenter. It has given excellent results with no measurable harmonic radiation and no TVI on a TV receiver very near. 73

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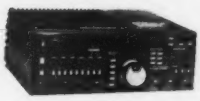

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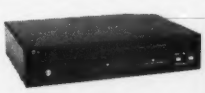

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CIRCLE 41 ON READER SERVICE CARD

ATV Transmitter, Part I.

Get on ATV easily and cheaply.

by William Sheets K2MQJ and Rudolf F. Graf KA2CWL

The "video revolution" of the last decade has made available to the average ham low-cost cameras and excellent low-cost video monitors. With a suitable transmitter, a simple downconverter, and a yagi or other antenna suitable for 430 MHz use, it is a fairly simple matter to get on ATV without mortgaging your house or cramming the shack with large surplus "boat anchor" broadcast equipment.

This article will describe a simple, efficient ATV transmitter for the 420-450 MHz band (70cm). It is roughly the size of a pack of cigarettes and runs from a 9-volt supply, delivering up to 1 watt of output (PEP), and also features full video bandwidth (5 MHz) with built-in audio subcarrier.

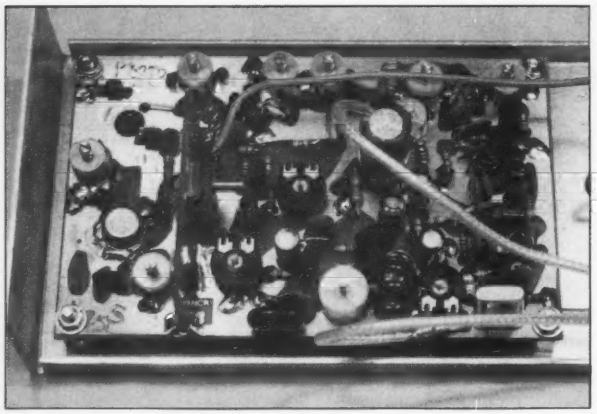

Photo. The 1-watt ATV transmitter.

Some possible amateur applications for this transmitter are:

- ATV base station exciter or low power transmitter.
- Video "lookie-talkie" handhelds, in conjunction with a small pocket TV set, downconverter, and miniature camera.
- Radio control applications: aircraft, boats, etc..
- Video links.

The ATV Transmitter

The transmitter uses 12 transistors, fits on a 2.5" x 4" (6.35cm x 10.2cm) PC board and directly interfaces with "standard" video devices. It requires 1-volt p-p, 75 ohm negative synch video (color or B/W) NTSC or PAL, and audio input can be 10 mV to 1V (line level) p-p into 5k ohm. RF output is nominally 0.75 to 1.0 watt (peak) into a 50 ohm load. It is easy to build, very reproducible and lightweight (about 60 grams or 2 ozs.). This design can operate over the range of 7 to 10 volts (9V nominal) at about 300 mA, making NiCd packs a feasible supply for portable or R/C applications. On-board audio and video level adjustments are included.

The transmitter is designed for single frequency operation, but a crystal switch can easily be added if multifrequency operation is desirable. While the NTSC system is the video format the transmitter is designed around, PAL operation is possible. Remember that the transmitter can be thought of as an AM transmitter with 5 MHz video bandwidth, and an (optional) added subcarrier at 4.5 or 5.5 MHz that can be FM modulated.

This project is also an excellent education in solid-state transmitter circuitry for those amateurs wishing to get some experience in this area. Picture quality is excellent, and minimal test equipment (VOM, 50 ohm load, 9V supply) will suffice.

When building this project, use only the parts specified in the Parts List. UHF circuits can be quite critical as to both component type and value. Also, proper parts placement is very important. Lead lengths should be very short. Anything longer than nearly zero may cause problems. Note that 10 surface mount capacitors (chips) are used, as well as ferrite beads. Also, tenth-watt (eighth-watt resistors can be substituted) resistors and miniature NPO ceramics are employed for very short leads and close component spacing. Tiny slug-tuned coils, easily made by the constructor using readily available materials, are used rather than commercial, hard-to-get, large shielded factory-made types. This gets rid of coil procurement headaches. If the dimensions are followed, no problems should result. In particular, supply bypassing is very important. We have incorporated chip capacitors to guarantee this. By keeping everything small, compact, and by using a shielded, double-sided PC board with good bypassing techniques, all the possible "horrors" associated with VHF and UHF circuitry can be easily dealt with. As long as the design is exactly duplicated there is no reason to encounter "nightmare, off-the-wall, weirdo" problems. The coils are easy to wind and the largest ones have only eight or nine turns of wire (see Figure 4 and the Table). In fact, several are only loops or pieces of wire, since inductors required at 440 MHz are usually in the 0.01 and 0.1 µH range. However, the PC board is compact, and parts are very small. A small soldering iron with a pointed

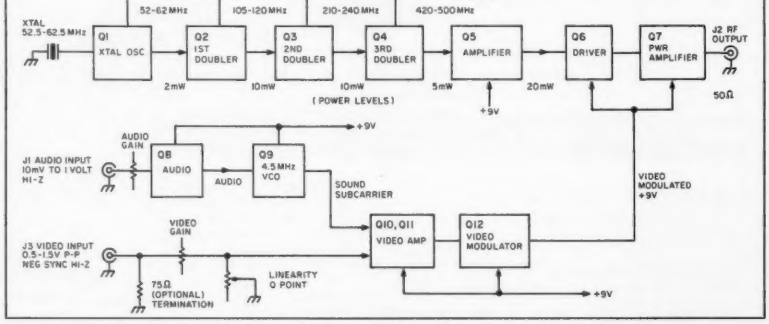

Figure 1. Video transmitter block diagram.

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• Separate Volt and Amp Meters				
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RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

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MODEL RS-7A

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RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46

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MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
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• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

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VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
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MODEL RS-12S

• Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

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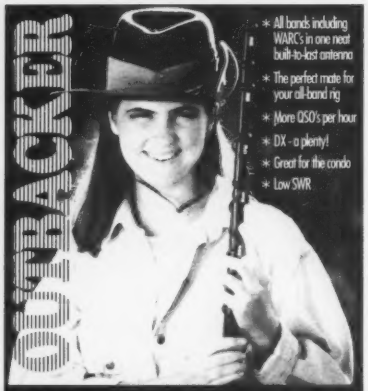
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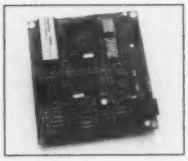

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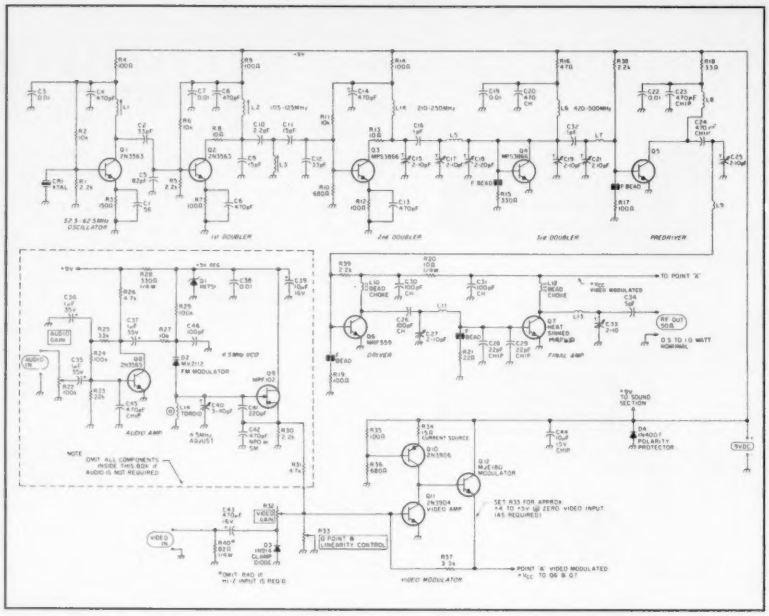

Figure 2. Schematic diagram of the 1-watt, 9-volt ATV transmitter.

tip is recommended, especially for soldering in the chip capacitors.

A discussion of precautions at VHF-UHF also appears in our February 1986 *Radio Electronics* article, "Build this Wireless Video Link." Anyone interested in building this project may find this article very informative.

Circuit Overview

The transmitter board's 1-watt level is capable of several miles of transmission range and those intending to use this design *must do so under appropriate legal circumstances and suitable licensing; this means you must have at least a Technician class amateur radio license.*

The transmitter is illustrated in block diagram form in Figure 1. Twelve transistors are employed and a 9-volt supply such as NiCds, an IC regulator, or AC-operated supply is assumed. Q1 is a crystal oscillator operating at one-eighth (1/8) of the picture carrier frequency. It is operated between 52.5 and 56.25 MHz with the circuit constants shown in Figure 2. This corresponds to a 420 to 450 MHz output frequency, which covers 430 MHz ham TV. With modification of circuit constants, higher or lower frequencies are possible, with reduced performance above 500 MHz and possibly somewhat enhanced performance below 420 MHz (more RF output), depending on the particular tran-

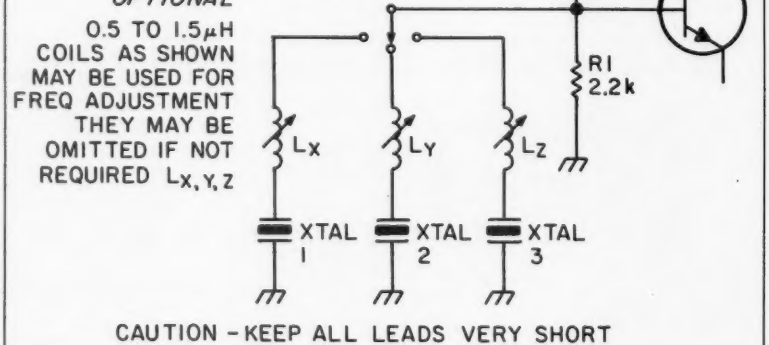

Figure 3. Scheme for XTAL switching.

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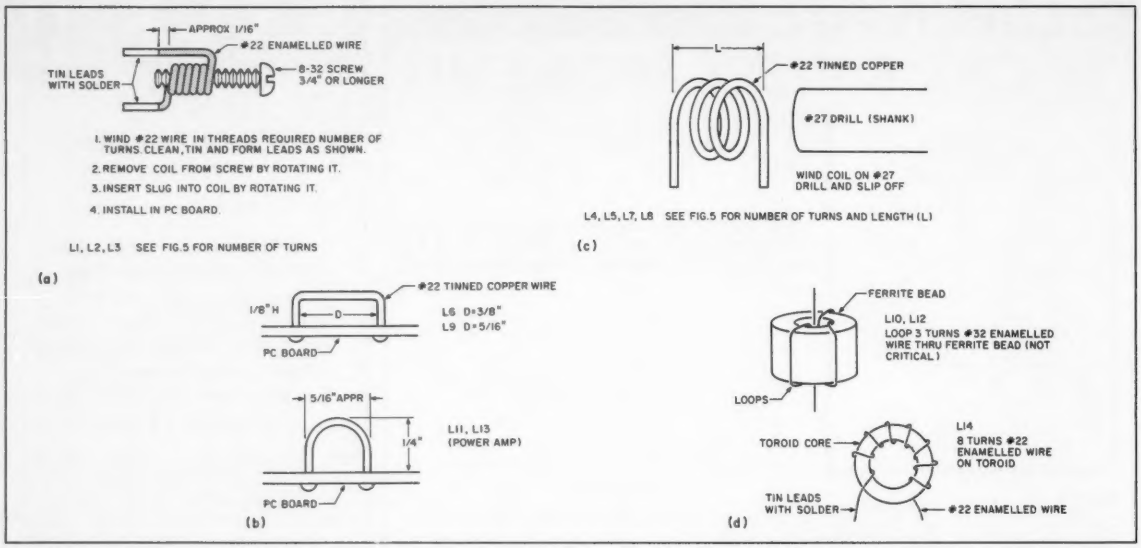

Figure 4. Coil construction.

sistors used. (This choice is left to you.)

Q2 is driven by the output of Q1 (about 2-5 milliwatts) and acts as a doubler. Q2 feeds Q3 with a signal twice the frequency of the crystal. Q3 doubles the frequency to four times crystal frequency, typically 210 to 225 MHz. Double-tuned interstage networks are used to suppress unwanted harmonics. Q4 doubles the output frequency of Q3 to the final output frequency. About five milliwatts of RF power are available. Q5 is an amplifier tuned to the output frequency. Its function is to amplify the signal at the output frequency present at the output of Q4. About 30-50 milliwatts of RF power is developed by Q5. Q6 and Q7 form a power amplifier. The power amplifier employs high gain RF semiconductors, and matching networks are adjustable for optimum tune-up. A fixed tuned strip-line design was contemplated, but at 420 MHz it would have occupied too much PC board area to comfortably fit on a 2-1/2" x 4" PC board. Use of broadband chokes and surface mount (chip) capacitors, and careful design to avoid possible low frequency spurious oscillation problems, have resulted in a very stable, efficient, reproducible circuit and you shouldn't encounter any UHF "horrors" if the design is reproduced exactly as shown, using the specified components.

Audio input at J1 from 10 millivolts (microphone) to 1 volt (line inputs, etc.) is fed to audio amplifier Q8. A level control is provided for optimum modulation adjustment. The audio modulates VCO circuit Q9, which produces a 4.5 MHz FM signal. This is the sound subcarrier. It is fed to video amplifier Q10 where it is combined with the input video signal from J3. The video input may be 0.5 to 1.5 volts p-p, negative synch. Q10 and Q11 form a video amplifier which feeds modulator Q12. Q12 is capable of producing a video signal which has 0 to +12V level swing, and can drive a load up to 1 ampere. Bandwidth at -3 dB is in excess of 10 MHz, assuring crisp picture detail. Q12 acts as a power supply to Q6 and Q7, effectively AM modulating the RF power output. A linearity control adjusts the operating point of Q12 for optimum modulation linearity. The Q point must be properly set, otherwise clipping of the video signal will occur. This will produce "burned-out" picture highlights (white areas) with loss of detail, and/or synch "buzz" in the audio, as well as loss of picture stability in extreme cases.

In ATV practice, sometimes the 4.5 MHz subcarrier is not used, but a separate "talk back" channel on the 2 meter amateur band is used instead for audio and/or liaison purposes. If you don't want the 4.5 MHz sound subcarrier, simply leave out Q8, Q9 and all VCO/audio components. This won't affect video peformance in any way and, in fact, can simplify things somewhat, since synch buzz problems will be much less likely with a separate sound transmitter, and video performance can be optimized without allowing for audio performance. However, the audio section of this transmitter is perfectly adequate for most amateur applications.

Circuit Description

Refer to Figure 2. Crystal oscillator Q1, a 2N3563 VHF NPN transistor, is biased to initially 7 volts and 5 milliamperes Q point by resistor R1, R2, and R3. Crystal CR1 acts as a series resonant "bypass" to ground only at the crystal series resonant frequency (52.5 to 56.25). At this frequency, Q1 acts as a common-base amplifier. Tuned circuit L1 and C2, in series with C5, together with stray capacitance of about 1 to 2 pF, form a load for the collector of Q1. C3 and C4 bypass the "cold" end of L1 solidly to ground for AC signals. Internal feedback from collector to emitter occurs in Q1 via the intrinsic collector-to-emitter capacitance of Q1 about 2 pF. C1, a 56 pF capacitor, forms a voltage divider to feed back a portion of collector signal to the emitter. Note that C1 is not an emitter bypass but a part of the feedback network of oscillator Q1. Therefore, at the series resonant (crystal) frequency of CR1, Q1 acts as a grounded base oscillator. An RF signal is generated at this frequency. DC is supplied to the Q1 stage through decoupling resistor R4. Collector current, once Q1 starts to oscillate, is dependent on the tuning of L1, but typically is 5-10 milliamperes. If two or more frequencies are desired, a switch can be installed (Figure 3), however, some tuning compromises may be needed if the output frequencies are more than 5 MHz apart. A portion of this voltage (about 1.5 volts RMS) across L1 is fed to Q2 by the voltage division between C2 and C5. C5, an 82 pF capacitor, has a low impedance at twice the oscillator frequency. Q2 is biased initially the same as Q1 via R5, R6 and R7. C6 is a bypass capacitor, as are C7 and C8. Q2 acts as a frequency doubler by the fact that a large drive signal from Q1 causes rectification in the emitter base junction of Q2. This produces appreciable harmonic generation. Keeping the impedance low in the E-B circuit of Q2 by using a large value (82 pF) for C5 results in efficient harmonic generation.

C7 and L2 are tuned to normally twice the crystal frequency. R9 supplies DC to Q2 stage. Tuning is accomplished via a slug in L2. C10 couples RF energy at 2X crystal frequency to a second tuned circuit, L3-C11-C12, also tuned to twice crystal frequency. Use of two tuned circuits assumes good selectivity and improved rejection of unwanted frequencies. This is important for a clean signal from the transmitter. R8, in the collector of Q2, suppresses a tendency to unwanted UHF parasitic oscillation. Q3 is fed energy at 105 to 112.5 MHz from the junction of C11 and C12. R10, R11, and R12 bias Q3. Since the RF level at the base of Q3 is high,

the RF level affects the bias. Typically, Q3 runs at 15 to 20 milliamps collector current. Q3 is an MPS 3866, a 400 MHz medium power (1-watt dissipation) plastic transistor. It offers superior performance at 250 MHz to the 2N3563 used at Q1 and Q2. Except for frequency, operation is similar to the Q2 stage. Q3 doubles the input frequency to 210 to 225 MHz. R13 suppresses UHF (>300 MHz) possibly parasitic oscillation. C15 and L4 are tuned to twice the input frequency. C14 is a 470 pF bypass capacitor. The 0.01 µF used in Q1 and Q2 is ineffective at 250 MHz and not used here, the 470 pF being sufficient. R14 feeds DC to Q3 stage. Note that now the output-tuned circuit is tuned by variable capacitor C15 and L4 is fixed. This is because slug tuning is no longer practical, the coil L4 having too few turns. C16 couples energy to tuned circuit C17, L5, and C18. This forms a double-tuned circuit at 210-225 MHz. C17 is the tuning capacitor. C18 is a variable capacitor to optimize matching into Q4, the last (third) doubler. R15, a 330 ohm resistor, with a ferrite bead to act as an RF impedance (see Figure 5) in series with it, completes the base circuit DC path for Q4. Bias now is supplied entirely by the drive signal. No extra DC bias is applied. The emitter of Q4 is directly grounded, since bypassing of emitter circuits at 420-500 MHz is difficult without some loss of RF gain. However, a low value of R15 keeps DC stability adequate.

C19 and L6 (a short length of wire is all that is needed) form a tuned circuit at 440 MHz. C19 and C20 provide low frequency (video) and RF bypassing. C19 provides little bypassing at UHF. Its purpose is to kill stray low frequency gain of the Q4 stage. C20 is a chip capacitor, the only type effective at 440 MHz. It provides a solid RF ground for the cold end of L6. The 440 MHz signal at the collector of Q4 is fed to tuned circuit C21 and L7 via C32. C21 and L7 match the low base impedance of Q5 to the collector circuit of Q4 and form a double-tuned UHF circuit together with C19 and L6. R17 and the ferrite bead provide a low DC impedance but a high RF impedance to the base of amplifier Q5. Q5 amplifies the UHF signal to about 30 milliwatts. L8 acts as an RF choke. C22 and C23 perform bypassing for video and UHF respectively. C24, a 470 pF chip, couples RF output but blocks DC from tuned circuit C25 and L9. L9 acts as a matching inductor to the base of driver transistor Q6. Q5 is fed straight, unmodulated +9 volts DC. Q6 receives the drive from Q5. R19 and the ferrite bead on one lead of it provide high RF impedance and low DC resistance to the base of Q6. Since a ferrite bead looks more like a high resistance rather than a reactance at high frequencies, the effective Q is very low. This prevents the possibility of parasitic oscillations that could occur if a conventional type solenoid wound RF choke were to be used.

C27, L11, and chip capacitors C28 and C29 match the collector impedance of Q6 and Q7. L10 is a ferrite bead choke made

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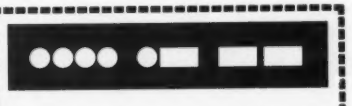
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with three turns of wire wound through a ferrite bead, in toroidal fashion (see Figure 4). This results in a very low Q, resistive impedance (about 1,000 ohms) and again avoids possible parasitics. C26 is a coupling capacitor, a chip to minimize stray inductance. C30 is a bypass capacitor chosen to provide a short circuit to UHF while looking like a high impedance at 10 MHz or lower, so the video signal component of this power supply voltage (modulation) is relatively unaffected. R20 is a coupling resistor. Q6 draws about 130 milliamperes current at modulation peaks (synch tips). It is an MRF559. The RF power level out of Q6 is in the range of 100-150 mW so that Q7 has sufficient drive to produce the 1 watt (PEP) nominal output. Q7, an MRF630, is similar to Q6 in its operation. R21 and the ferrite bead on one lead (see Figure 5) allow low DC base circuit resistance with high RF impedance as for Q6. L12 is an RF choke exactly the same as L10. L13 and C33 form the collector matching circuit, together with mica capacitor C34, to match the 50 ohm load impedance to the optimum collector load impedance needed by Q7. *Note that a 50 ohm load must always be present at J2.* Otherwise, Q7 may be damaged. A tolerance of +/- 50% (25 to 100 ohm) is permissible here. However, optimum performance is obtained with a 50 ohm load.

Suitable 50 ohm coax must be connected from C34 (on the PC board) to K1, with short connections (1/4" or less). Any length of coax can be used, but for best results, keep the coax short. We used RG174/U PVC type but a type such as Teflon™ coax (RG188/U) would be better. From J2, standard coax (RG58/U, etc.) will do. Remember, feedline loss can be very high at 420 MHz and up. Preferably, connect the coax, with near zero lead length, to the bottom side of the PC board, very close to C34. Solder the shield directly to the ground foil, as close to the pad connecting C34 as possible. C31 is an RF bypass. Q6 and Q7 are fed video-modulated 9 volts from Q12, which will be discussed later.

Input video from J3 (std. 1V p-p negative synch, etc.) is fed through C43 to clamp diode D3. Note that C43 is apparently incorrectly polarized. This is to allow for certain video equipment that may have a DC component of up to 16 volts present on the video output. If you do not expect to encounter this, you can reverse the polarity of C43, if you wish. The low reverse voltage (0.6 volt) appearing across it doesn't do any harm. D3 clamps the maximum negative input level to -0.7 volts and avoids serious overmodulation at synch tip level. If you wish, you can DC couple from J3 directly into R32, the video gain control, if your interfaces permit. Also, note optional 82 ohm termination resistor R32A. This resistor can be used if you want the transmitter video input to be a line termination (the usual case). Use it unless you are in a situation where loop-through (several other video loads in parallel) is required.

R32 acts as a video gain control. Video from R32 is fed to the base of video amplifier Q11. The collector of Q10 is fed by current source transistor Q10. Q10 is biased to about 50 milliamperes collector current by R34, R35, and R36. This permits the collector of Q11 to supply plenty of drive to modulate Q12 and eliminate the need for a low value resistor collector of Q11 to the power supply rail (+9V). This enables the base of Q12 to nearly approach the +9V supply level and allows a higher positive swing of the emitter of Q12 than a resistor from Q11 to +9V would permit, due to the base drive needs of Q12. Q12 an MJE180 is configured as an emitter follower. It must supply all the current to Q6, Q7, (or Q5) and must provide a very low supply impedance and very high slew rate. The low impedance is necessary for both full RF power output and control of parasitic oscillation tendencies in the Q6 and Q7 amplifier circuitry. Also, the load is capacitive, due to the bypassing from C30, C31, and also from C26. The Q12 circuit, in tests, can supply nearly 12 volts of video into a 10 ohm load with a +12V supply. (This is 1.2 amperes of current.) Q12 must be heatsinked. R37 provides feedback around the modulator to establish both Q point, video gain, and bandwidth. R33 sets the exact Q point (voltage seen at point A, the emitter of Q12), under zero drive conditions about 4 to 5 volts DC to Q6 and Q7. R33 is adjusted for maximum undistorted symmetrical video at point A, while R32 controls video drive to Q11. Supply bypassing must be effective at the collector of Q12 due to the high current, fast waveforms handled. A 10 µF 15V chip tantalum was used; conventional electrolytics were found to be somewhat less effective at C44, the main supply bypass capacitor. A diode D4, a 1N4007, is provided to serve as reverse polarity protection. Connect it directly across the +9V line to the transmitter board. It can be omitted if there is no possibility of supply reversal, and you are perfect and never make mistakes. Audio is fed to gain control R22 from jack J3. Input level is between 10 millivolts to 1 volt at high impedance, allowing direct interfacing with most microphones or other audio sources. Audio from R22 is fed through coupling capacitor C35 to Q8, a 2N3565. Q8 is biased from R25, R24, and R23. C36 is a bypass capacitor to prevent audio degenerative feedback and loss of gain. Collector load resistor R26 supplies DC to Q8. C37 couples audio to R27, and blocks DC. Note that no pre-emphasis (the providing of high frequency boost) has been used. If you want to use it, for better high frequency audio response change C37 to 0.001 µF and set the gain control R22 up higher to compensate for loss. We found we did not need it in our application, the audio being adequate. R27 couples audio to varactor diode D2, an MV2112 or MV2113. R29 provides DC bias of +5V to the varactor. The varactor diode varies the capacitance of D2 (56 pF at 4 volts, about 50 pF at 5 volts bias) at an audio rate. The capacitance of D2 appears across the 4.5 MHz oscillator coil, L14. Q9, an MPF102 FET, together with capacitors C41, C42, C40, and L14 form a Colpitts type RF oscillator operating at 4.5 MHz. C40 is a trimmer (variable) capacitor to set the frequency to exactly 4.5 MHz. L14 is a toroidal coil to minimize both size and stray magnetic field generation. C46 provides RF grounding for D2 while blocking audio.

When D2 changes capacitance, the oscillator frequency shifts. Therefore, an audio voltage component on DC causes a frequen-

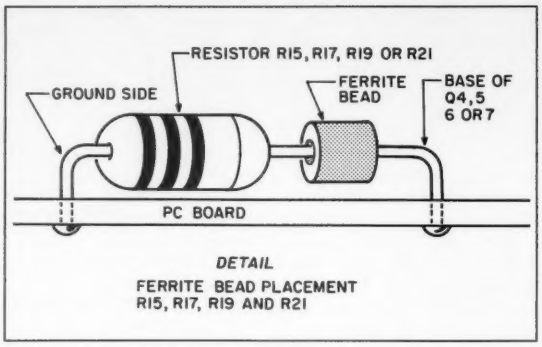

Figure 5. Using an RF choke on resistor leads.

Table 1. Coil Winding Data

Coil	Description (# Turns, Length)	Form	Notes
L1	9-1/2 turns #22EN	8-32 screw	Slug reqd.
L2	3-1/2 turns #22EN	8-32 screw	Slug reqd.
L3	4-1/2 turns #22EN	8-32 screw	Slug reqd.
L4	3 turns #22 tinned	#27 drill	1/4" long
L5	4 turns #22 tinned	#27 drill	1/4" long
L7	1-1/2 turns #22 tinned	#27 drill	1/16" long
L8	2-1/2 turns #22 tinned	#27 drill	3/16" long
L6,L9,L11,L13	Less than 1 turn	PC board	Per Figure 4
L10,L12	Bead choice, #32EN	Ferrite bead	Per Figure 4
L14	8 turns #22 on 768T188 toroid	Toroidal Core	NTSC 4.5 MHz Sound
	6 turns #22 on 768T188 Toroid		PAL 5.5 MHz Sound

Note: All coils may require plus or minus a turn due to normal variation and construction. (This is to be expected.) Due to individual tolerances, construction techniques L1 through L3 may require plus or minus one turn. This may be true of L14. L4, 5, 6 and 7 may have to be spread or squeezed lengthwise. Dimensions shown are from an average of five units and yours therefore can vary to some degree.

Parts List

Resistors: 1/8 or 1/10W

P/N	Value
R1,R5,R38,R39,R30	2.2k ohm
R2,R6,R11,R27	10k ohm
R3	150 ohm
R4,R7,R9,R12,R14, R17,R19,R35	100 ohm
R8,R13	10 ohm
R10,R36	680 ohm
R15	330 ohm
R16	47 ohm
R18	33 ohm
R20	10ohm 1/4W
R21	22 ohm
R22	100k pot
R23	22k ohm
R24,R29	100k ohm
R26,R31	4.7k ohm
R27	10k ohm
R28	330 ohm 1/4W
R32,R33	1k ohm pot
R34	15 ohm
R37	3.3k ohm
R40	82 ohm 1/4W

Capacitors:

Capacitor	Type
C1	56 pF NPO
C2,C12	33 pF NPO
C3,C7,C19,C22,C38	0.01 µF disc
C4,C6,C8,C13,C14	470 µF disc
C5	82 pF
C9,C11	15 pF
C10	2.2 pF
C15,C17,C19,C21, C25,C27,C33	2-10 pF trimmer
C16,C32	1 pF NPO
C18	2-18 pF trimmer
C20,C23,C24,C45	470 pF chip
C26,C30,C31	100 pF chip
C28,C29	2.2 pF chip
C34	5 pF mica
C35,C36,C37	1 µF/(35 or 50V) electrolytic
C39	10 µF/16V electrolytic
C40	3-40 pF trimmer
C41	220 pF NPO
C42	470 pF NPO
C43	470 uF/16V electrolytic
C44	10 uF/15V chip tantalum
C46	100 pF NPO

Semiconductors:

Q1,Q2	2N3563 transistor
Q3,Q4,Q5	MPS3866 transistor
Q6	MRF559 transistor
Q7	MRF630 transistor
Q8	2N3565 transistor
Q9	MPF102 transistor
Q10	2N3906 transistor
Q11	2N3904 transistor
Q12	MJE180 transistor
D1	1N757 diode
D2	MV2112 varactor diode
D3	1N914 diode
D4	1N4007 diode

Inductors:

L1 - L14	See the Coil Table

Miscellaneous

1 toroid 76T188
6 ferrite beads
3 blue slugs (Cambion)
1 PC board
1 T0220 insulator
1 4-40 screw, nut, lockwasher
1 8-32 screw 1" (for winding of coils)
2 ft. #22 enameled wire
2 ft. #22 tinned wire
2 ft. #32 enameled wire
1 crystal 52.5 - 55 MHz

Note 1: Kits consisting of the PC board and *all* parts that mount on the board, including all necessary wire, are available from North Country Radio P.O. Box 53H, Wykagyl Station, New Rochelle NY 10804. The 1-watt ATV transmitter kit + crystal for 439.25 MHz is available for $112 + $3.50 postage/handling. Crystals for 434.0, 426.25 or 421.25* MHz are an additional $7.50 each. A 12-volt version of the ATV transmitter capable of a 2 watt output (similar in design to the 9-volt version - see the June/July '89 issues of Radio Electronics for details) is available for $110 + $3.50 p/h with ATV crystal. A metal case (5-1/2" x 3" x 1-1/4") suitable for the 9-volt or 12-volt versions of the transmitter complete with one power, one BNC and two RCA connectors is also available for an additional $15. To help you assemble a complete ATV station, two other items are also available: an ATV linear amplifier to boost your output power to 10 watts for $79.50 + $3.50 p/h (includes case, heat sink and all connectors and hardware) and a low noise (1.5 dB typical) ATV downconverter kit to enable reception of ATV signals using a standard TV set for $59.50 + $3.50 p/h.

***NOTE 2:** Operation on 421.25 MHz requires use of a VSB (Vestigial Sideband) filter (not available from North Country Radio but supplied by others) to prevent LSB components from being radiated outside of the band limits.

cy modulation (FM) of the 4.5 MHz signal generated in the Q9 circuit. R30 provides operating bias for Q9. Resistor R31, a 15k ohm resistor, couples this sound subcarrier (4.5 MHz FM signal) into the video amplifier, which modulates it onto the RF signal along with the video.

R28, zener diode D1, and bypass capacitors C38 and C39 supply a regulated +5.1 volt nominal DC voltage to Q9 and varactor D1. The regulation reduces or eliminates oscillator drift if the supply voltage were to vary. A frequency counter can be connected to point A to set C40 to exactly the value needed for 4.5 MHz sound subcarrier frequency.

If PAL operation is contemplated, simply modify L14 as described in the Table. The audio circuit has sufficient drive for the deviation required. Simply replace the 4.5 MHz mentioned in this text with 5.5 MHz as applicable.

Stay Tuned

Next month in Part II, we'll go over the final construction of the ATV transmitter PC board and tune-up of the circuit. 73

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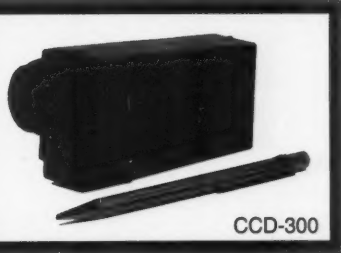
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The Explorer

HF receiver for 40 and 80 meters.

by Paul G. Daulton K5WMS

Here is a unique application for the Signetics TDA7000 FM Receiver chip: as a two-band, 80 and 40 meter, CW and SSB receiver. How, you are asking, do you receive CW and SSB on an FM system? I only used the oscillator and mixer sections as an on-frequency product detector or direct conversion receiver. Performance exceeds existing designs using the NE602. There is no kit available for this receiver, but sufficient information is given in this article to duplicate what I have done or to design your own receiver.

NE-602 Designs

Direct conversion receivers using the Signetics NE-602 IC chips have made quite a stir with home builders in the last three or four years. Basically a double-balanced mixer with an on-board oscillator and associated regulator components, the NE-602 in combination with a 50 or 250 mW audio amplifier makes an excellent direct conversion receiver with only a minimum of support components. I have built two of the Neophyte receivers (*QST*, February 1988), the Ramsey HR-8080 kit, and a couple of home-brew designs. The Sudden Receiver in the October 1991 *73 Magazine* is another fine example of an NE602 application.

Direct conversion receivers using the NE602 and LM386 do have a couple of drawbacks. The worst is lack of dynamic range. Most designs provide for an attenuator pot on the input. The operator must constantly ride the gain, say when listening to a round table on 75 meters when the stronger signals drive the 602 into distortion. Second, the NE602 with an LM386 audio output stage has insufficient volume to drive a speaker to a comfortable listening level. The NE602 has a maximum voltage rating of 8 volts.

The TDA7000 Advantage

The TDA7000 operates at 12 volts. This, in combination with an LM386 output stage, has plenty of audio to drive a 3" or 4" speaker. Front-end overload is not a problem. The TDA7000 was designed as a receiver front end for cordless phones, Walkman radios, and the like. The NE602, on the other hand, was designed as a second IF for cellular phones where it operates in a more steady-state condition.

Just by coincidence I noticed the similarity of the NE602 to the TDA7000. The TDA7000 is an 18-pin dip with a mixer, an oscillator, and two op amps for audio frequency (70 kHz) IF stages, muting, and FM detector stages. I built the first prototype on a Radio Shack experimenter's socket, using only the oscillator and mixer of the TDA7000. For audio I used a Radio Shack mini-amplifier speaker. Coils were wound for 80 meters on 1" sections of the barrel of a BIC pen. This only took about 20 minutes to throw together. Performance of the first prototype was so good I quickly (in 45 minutes) transferred the parts to a perfboard, adding a VFO coil for 40 meters. All this took place between 10 p.m. and midnight on a Saturday night.

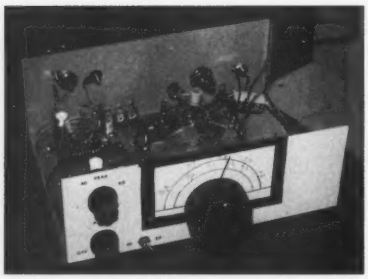

Photo A. Final version of the Explorer HF receiver with the cover removed.

Performance of the prototype TDA7000 receiver was better than the other direct conversion receivers I have built using the NE602. I was particularly interested in developing a design that could be given to the local Explorer Scouts, something that the youngsters could build even if they had to buy the parts one piece at a time. As a result, I've tried to specify parts that are available at a local Radio Shack store.

The only parts in this design not available at Radio Shack stores are the TDA7000, the varicap diode, and the vernier dial drive. Although Radio Shack used to carry the TDA7000 IC, they discontinued carrying it while I was designing this circuit. However, DC Electronics, phone no: (800) 423-0070, in Scottsdale, Arizona, lists this device for $5.95 in their recent catalog. This is about $3 more than the NE602, but the extra cost is more than offset by the increased performance and circuit simplicity. The varicap diode is an ECG replacement and can be ordered through most Radio Shack stores, or with a change in layout a 365 pF air variable could be used in its place. The dial drive and tuning cap are a matter of builder's choice. I suggest a sturdy double-bearing capacitor for the VFO tuning cap. This could be salvaged from an old tube-type AM radio. An alternate for the tuning cap using the 440 pF ECG618 varicap and a potentiometer is shown on the schematic diagram.

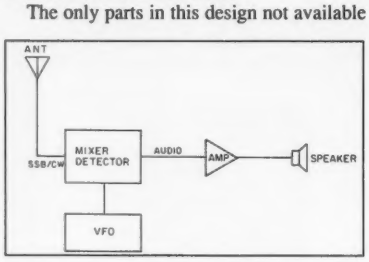

Figure 1. Diagram of the basic direct conversion receiver.

Construction

The final version presented here was built in a RS# 270-274 cabinet with dimensions of 3-1/16" x 8-1/4" x 6-1/8". This is the minimum size I would recommend for a small receiver of this sort. You need panel space for a reasonable size dial and room to operate the controls. The main tuning dial is a vernier drive of unknown origin, with a brass wire for a pointer. A 3" x 5" file card was cut down and lettered for the scale. This is held in place with vinyl tape. I tried to duplicate the look of the old National MCN dial assembly that was so popular back in the '50s and '60s. Dry transfer letters were used on the panel, with an overspray of clear acrylic aerosol. The speaker grill is a piece of material called plastic canvas, available at most discount retail and craft stores. A word of caution is in order if you plan to mount the speaker in the Radio Shack cabinet. Find an electrician with a hydraulic operated knockout punch to make the hole. This cabinet is made of a very tough, thin, spring steel. I ruined a fly cutter and a hole saw trying to make the hole for the speaker. Either punch a large hole or drill a grid of small holes for the speaker.

I used a 3" x 4" piece of copper-clad phenolic, glued to the bottom of the cabinet, copper face up, to mount the components and terminal strips. All ground connections are made to the copper foil. IC sockets were

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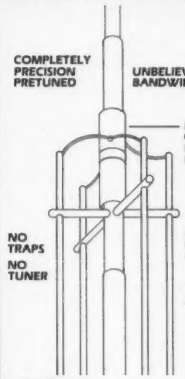

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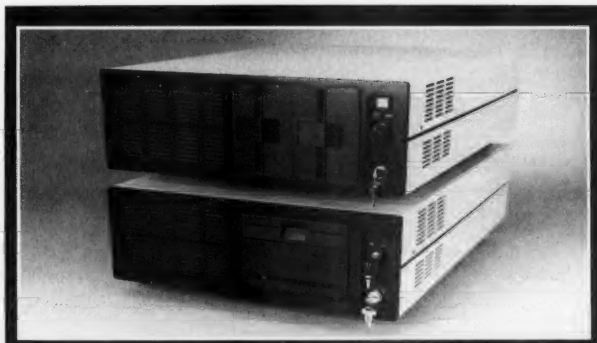

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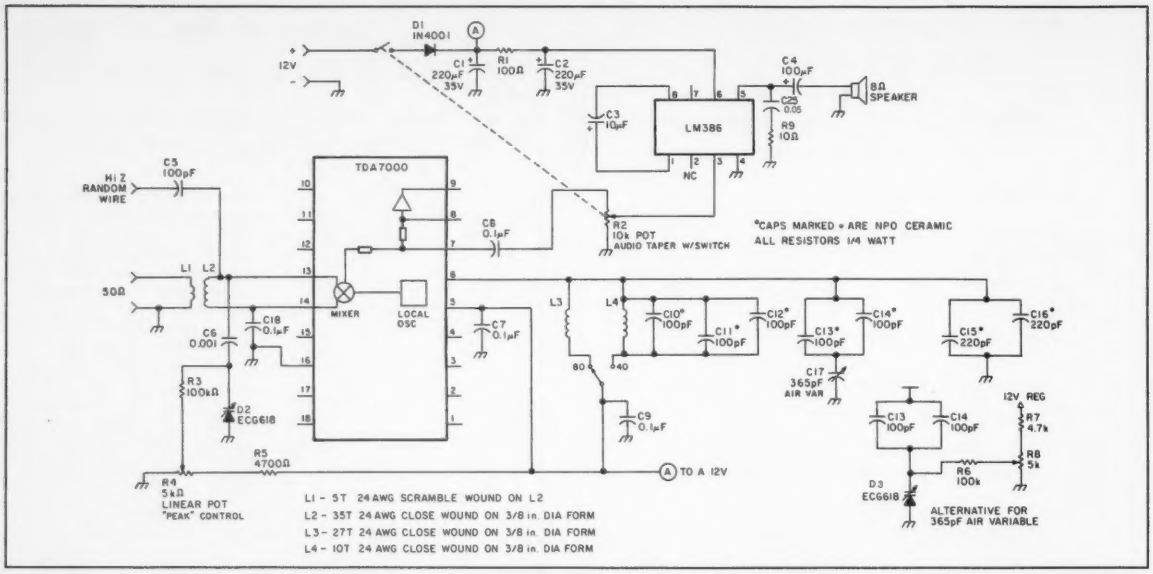

Figure 2. Schematic diagram of the Explorer 80 and 40 meter receiver.

soldered to RS part no. 276-159A IC experimenter's boards. Note from the pictures that this board is turned upside down for easy access to the solder terminals, and mounted on stand-off bushings. You could also glue this to the copper foil with a piece of insulating material between the board and the foil to prevent shorts caused by solder leaking through the holes. This type of construction was popularized by Bill Hoisington K1CLL back in the 1960s in many *73 Magazine* articles.

Solid conductor wire was used for point-to-point wiring. Twisted pairs were used on the leads going to the audio gain control to eliminate hum. Bandswitching is accomplished by switching only the VFO coils. The two-terminal oscillator circuit of the TDA7000 simplifies this. A varactor diode tunes the antenna coil to the desired band. With the values shown, this coil will tune from 3 to 11 MHz. It would be very simple to add 30 meters to this receiver with the appropriate coil and capacitor values in the VFO section. Both 50 ohm link coupling and a high impedance input are provided on the receiver input. I originally intended to build an active antenna stage into this receiver, but I found this was not necessary. It will perform amazingly well with a 3' to 15' piece of wire connected to the Hi-Z input.

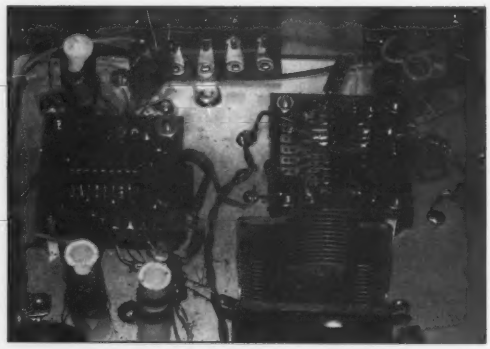

Photo B. Top view of TDA7000 receiver board (left) and the audio amplifier board (right). Antenna coil is shown in the upper left and the VFO coils are shown in the lower left. All sockets and components are mounted on the copper foil side of the prototype board (available from Radio Shack). The extra IC socket on the audio board is for future expansion.

Coils

I wound my coils on plastic tubing purchased at a local hobby shop. Glue or tape the first turn down, wind the coil with a couple of extra turns, and coat the coil with clear fingernail polish. It may seem strange not to have any adjustment on the coils or trimmer capacitors for calibration, but once you have the VFO in operation it only takes a few minutes to adjust the tuning range by peeling one turn at a time off the coils or soldering fixed values of capacitance to raise and lower the tuning range. Lowering the inductance by peeling off turns raises the frequency and increases the range of bandspread from minimum to maximum capacity of the VFO capacitor. Adding capacity in parallel to the VFO coil produces the opposite effect. I made the dial scale to match what I wound up with. I mounted the coils vertically by gluing the ends to the copper-clad surface with Super-Glue.

Audio

If you want you can omit the LM386 audio stage and purchase a mini-amplifier speaker, RS part no. 277-1008, or use whatever audio amp you have available. I used one of the op amp IF stages in the TDA7000 for audio selectivity, then later both op amps (see Figure 3). The first is a Salien-Key low-pass filter with a cutoff frequency of 2000 Hz. The second op amp is a bandpass filter. Components were selected to give a bandpass of 300 to 2500 Hz for SSB reception. Formulas for using the op amp IF filters are available from Signetics. Radio Shack included an application data sheet with their TDA7000. This data is available in the 1988 Archer semiconductor application manual. I would suggest you build the receiver as shown in the main schematic before proceeding with the audio filters. Dave N5KRN runs the output of his receiver into a Kenwood audio graphic equalizer and then to a 2 watt audio amp with a pair of large speakers. You have to hear this combination to believe the quality. [*Ed.Note: use only C8 if no filter is used, C8A for the low-pass filter or C8B for the bandpass filter.*]

Performance

Minimum discernible signal as best as I can measure is less than 0.2 microvolts. My ancient Measurements Model 80 is not RF tight enough to measure this weak a signal. The figure of 0.2 microvolts was arrived at by "hardening" the generator output with a 20 dB pad and scaling back to arrive at the MDS of 0.2 microvolts. Stability is quite good. All caps used in the frequency-determining circuits were NPO disk ceramic. Use polystyrene or silver mica types if you wish. For daytime operation I generally use a dipole antenna connected to the 50 ohm input. At night when signals are much stronger I use a random wire 3' to 15' in length con-

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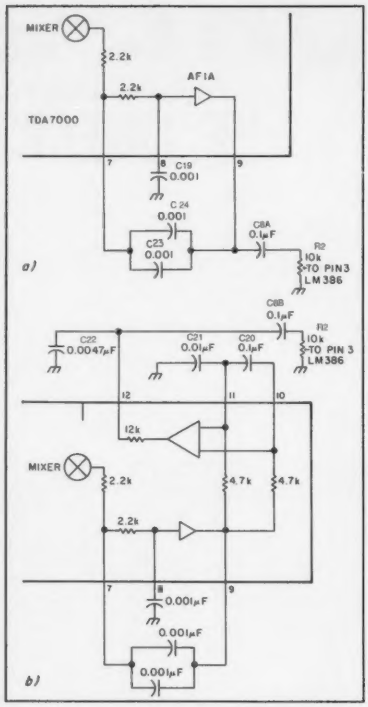

Figure 3. Schematic diagram for alternate audio selectivity using the internal op amps in the TDA7000.

Parts List

U1	TDA7000 receiver IC
U2	LM386 audio amplifier IC
D1	1N4001 diode
D2	ECG618 varicap diode
R1	100 ohm resistor
R2	10k potentiometer, audio taper with switch
R3	100k resistor
R4	5k linear potentiometer
R5	4.7k resistor
C1,C2	220 µF/35V electrolytic capacitor
C3	10 µF electrolytic capacitor
C4	100 µF electrolytic capacitor
C5	100 pF disc ceramic
C6,C19*, C23*, C24*	0.001 µF disc ceramic
C7,C8, C9,C20*	0.1 µF disc ceramic
C10,C11, C12,C13,C14	100 pF NPO disc ceramic
C15,C16	220 pF NPO disc ceramic
C21*	0.01µF disc ceramic
C22*	0.0047 µF disc ceramic
C17	365 pF variable capacitor
Alternative to 365 pF variable:	
R6	100k resistor
R7	4.7k resistor
R8	5k potentiometer
C13,C14	100 pF NPO disc ceramic
D3	ECG618 varicap diode

*** Optional filter components**

An etched and drilled PC board is available for $4.50 + 1.50 shipping/handling from FAR Circuits, 18N640 Field Court, Dundee IL 60118. The TDA7000 is available for $5.95 from DC Electronics, P.O.Box 3203, Scottsdale AZ 85271. Phone: (800) 423-0070 or (602) 945-7736.

nected to the Hi-Z input. This helps cut down the trash and QRM. While experimenting with this I have had the TDA7000 operating from 160 to 15 meters with good results.

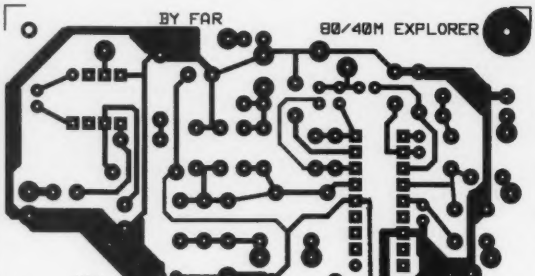

Figure 4. The optional PC board foil pattern.

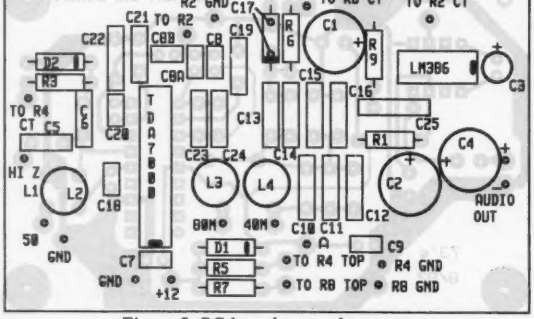

Figure 5. PC board parts placement.

Have fun with this project. As I stated in the beginning, no kit is available, nor is any planned.[*Ed. Note: A PC board is available, see the parts list for details.*] I drive an 18-wheeler for a living and I am gone three to five nights a week, so I don't have the time to pursue a kit project. I wrote this article at the urging of some of my ham friends, because this application for the TDA7000 is too good to sit on and not get the word out to other experimenters. I hope that this article will inspire some of the better builders to use the TDA7000 as I have done and develop a good kit on a PC board with premanufactured coils and such. If someone does I'll be one of the first to buy one! My thanks to Dave Burke N5KRN and Bill Allsop W5TJY for their help and encouragement in this project. 73

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A lot of ham shacks have one or more good old transmitters or transceivers that lack automatic modulation control. Here is a universal mike level unit that features the latest in digital audio control. It will work with almost any transmitter/mike combination to provide consistent full modulation, over a range of up to 12 dB. It's the way to get the best performance from any transmitter, without any internal wiring change.

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The Circuit

Most ALC circuits are a variation of Figure 1a or 1b. Because an increase in the output of the variable-gain amplifier above a certain level reduces the amplifier's gain, its output is reduced—not to the level just before the "knee" is reached, but slightly more. Thus, the output level will continue to rise, if only about 1 dB, over a 10 dB range of input above the compression level. If the modulation is set at 85 percent, for example, the actual modulation percentage will generally increase to about 95 percent at 10 dB of compression.

Other things that must be considered in such a circuit are the attack and release times of the gain control circuit. The attack time, which must be very short to prevent any portion of the audio peaks from exceeding the pre-set limits, is primarily determined by the value of C in the RC network, the output resistance of the amplifier, and the forward resistance of the rectifier. The release time is determined primarily by the values of C and R. To get the desired fast attack and slow release, the reverse resistance of the rectifier and the input resistance of the amplifier become limiting factors. Also, both of these values become lower with an increase in temperature. And, as C1 is discharged at a non-linear rate, compromises must be made in the values of both C and R.

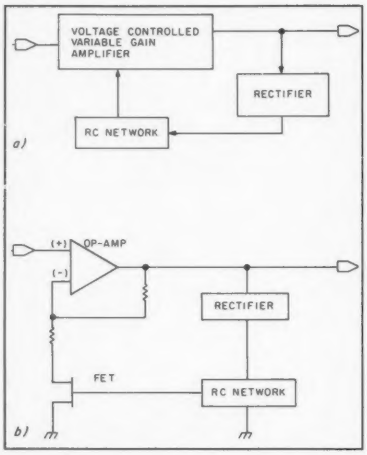

Figure 1a, 1b. Block diagrams of standard ALC circuits.

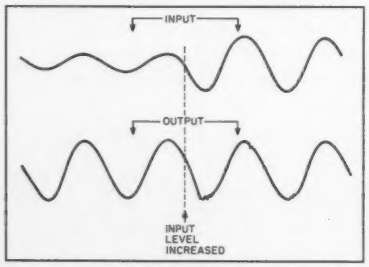

Figure 2. Scope tracings.

The digital ALC circuit shown in the block diagram of Figure 2, and schematically in Figure 3, overcomes these problems by using two comparators: one to establish the maximum output, and another set of about 1/2 dB below the first. Whenever the audio input level is sufficient to activate the first comparator, two things occur: The 4029 counter Up/Down input is switched to UP; and a high speed (300 kHz) pulse generator (one section of a 4093B) activates the clock input of the 4029. The 4029 outputs (Q1, Q2, Q3, and Q4) enable individual sections of the quad bi-directional audio switches. These switches each control gain-reduction pads, in 3/4 dB increments, in and between the op-amp stages.

Therefore, gain reduction of up to 12 dB is attained by reducing the audio output in 3/4 dB steps, until that comparator becomes inactive. The second comparator is active all the time the first comparator is active. When the audio output peaks drop below the second comparator's reference, and remain below it for about a second, the Up/Down input of the 4029 is switched to DOWN and the 4093B slow counter is enabled and begins to increase the amplifier gain in 3/4 dB steps, at a relatively slow pace. Thus, the peak modulation is kept within less than one dB of maximum over a 12 dB range, but does NOT 'PUMP' if the peak levels remain relatively constant. (If the modulation peaks are at 95% at zero dB compression, they will also be 95% at over 10 dB of compression.)

The scope tracings in Figure 4 show the input and output of the DALC. The initial input level is approximately -45 dBm. At the end of the first two cycles, the level is instantly increased by 10 dB. The lower (output) trace shows how quickly the first negative peak is reduced as the amplifier gain is digitally changed. The next positive and negative peaks have minor gain adjustments that effectively center the waveform. At the end of a cycle and a half, the output level and waveform are stabilized at the level it

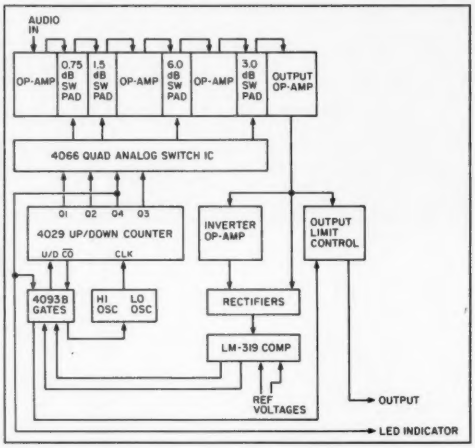

Figure 3. Block diagram of the Digital ALC.

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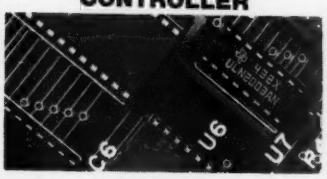

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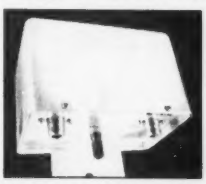

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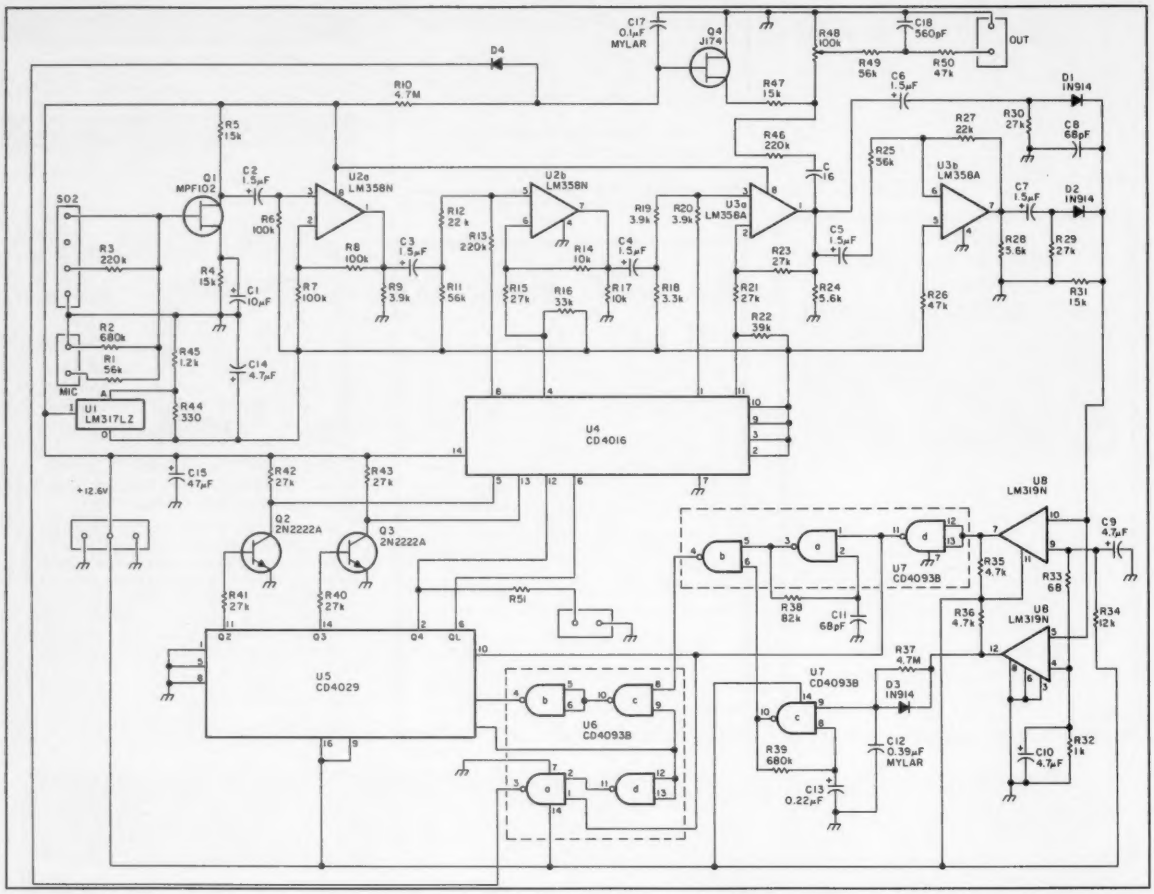

Figure 4. Schematic diagram of the digital ALC.

was before the input level increase.

The advantages of such a circuit include [a] precise incremental control of the maximum output (over a range of more than 3 to 1); [b] recovery that is at a consistent rate; and [c] maximum output level that remains constant over the compression range.

The diagram of a prototype of Figure 2 is shown in Figure 3. As it was intended as a microphone preamp that could be used with any transmitter, it uses an FET preamp feeding one half of an LM-358 dual op amp. If the output level of the microphone is excessive, a resistor may be installed in So(2) to reduce the input level to the appropriate amount. This is followed by two more sections of LM-358s that include a switched L-Pad in the input, plus a switched negative-feedback pad in each amplifier. The last LM-358 section is used as an inverter, to provide both positive and negative peak detection for the comparators.

The output of the third IC stage also passes through an RC audio filter, level reduction network and output level control before being applied to the transmitter MIC input. Included in this network, is an FET that automatically reduces the audio output by

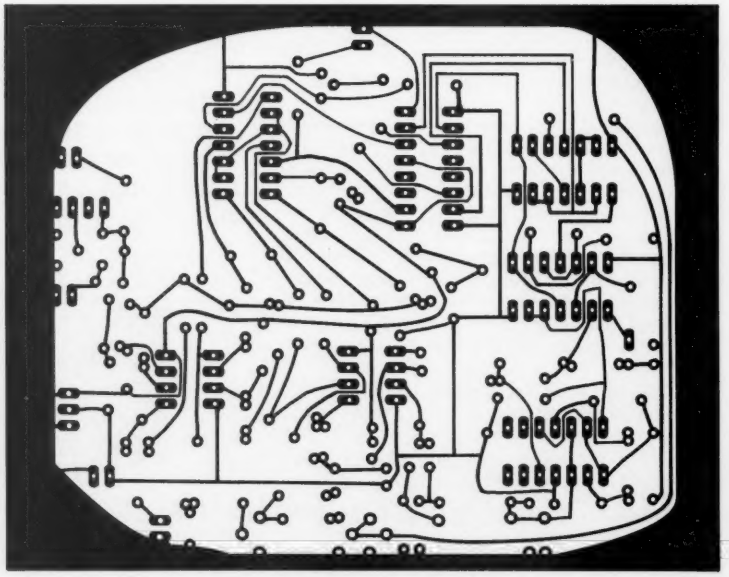

Figure 5a. PC board foil pattern.

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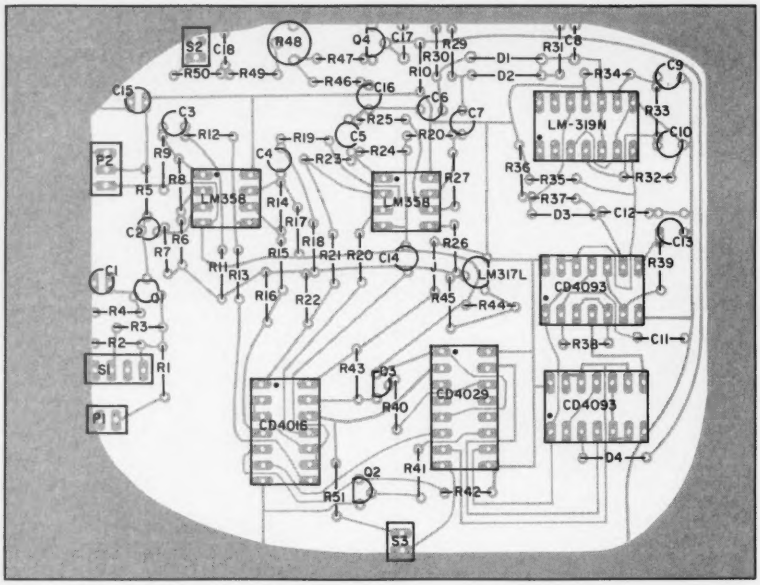

Figure 5b. PC board parts layout.

Parts List

Resistors:	
R1	56k
R2	680k
R3	220k
R4	15k
R5	15k
R6	100k
R7	100k
R8	100k
R9	3.9k
R10	4.7 MEG
R11	56k
R12	22k
R13	220k
R14	10k
R15	27k
R16	33k
R17	10k
R18	3.3k
R19	3.9k
R20	3.9k
R21	27k
R22	39k
R23	27k
R24	5.6k
R25	56k
R26	47k
R27	22k
R28	5.6k
R29	27k
R30	27k
R31	15k
R32	1k
R33	68 ohms
R34	12k
R35	4.7k
R36	4.7k
R37	4.7 MEG
R38	82k
R39	680k
R40	27k
R41	27k
R42	27k
R43	27k
R44	330 ohms
R45	1.2k
R46	220k
R47	15k
R48	100k pot
R49	56k
R50	47k
Capacitors:	
C1	10 µF/25V Elect.
C2	1.5 µF/25V Tant.
C3	1.5 µF/25V Tant.
C4	1.5 µF/25V Tant.
C5	1.5 µF/25V Tant.
C6	1.5 µF/25V Tant.
C7	1.5 µF/25V Tant.
C8	68 pF ceramic
C9	4.7 µF/25V Tant.
C10	4.7 µF/25V Tant.
C11	68 pF ceramic
C12	0.39 µF/Mylar
C13	0.22 µF Tant.
C14	4.7 µF/25V Tant.
C15	47 µF/25V Elect.
C16	2200 pF mica
C17	0.1 µF Mylar
C18	560 pF
Diodes:	
D1, D2 & D3	1N914 or equiv.
FETs:	
Q1	MPF-102
Q4	J174
Transistors:	
Q2, Q3	2N2222A
ICs:	
1 ea.	LM-319N
2 ea.	LM358N
1 ea.	CD4016 (or CD4066)
1 ea.	CD4029
2 ea.	CD4093B
1 ea.	LM317LZ

about 50% if the input from the microphone is driving the ALC circuit beyond its designed maximum of 12 dB of audio level compression. This FET is deactivated as soon as the audio peaks no longer exceed the compression range.

A jack is provided for an LED that will light at 6 dB of compression, and remain lighted at all higher compression levels. The microphone input level should be such that this LED flashes on occasionally, but not continually, while the transmitter is being modulated.

With both input and output levels easily adjusted, this unit will work well with almost any transmitter with medium to high impedance input.

This MIC level device is just an example of a practical application of digital ALC. For use within a transmitter under construction, the input FET, and output pad network could be eliminated—and the DALC inserted in the audio chain wherever the level is about 1V. Adding another counter and quad bilateral switch would permit the incremental peak output range to be any fraction of a dB, and/or the range could be extended to 15 or 20 dB. 73

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73 Review

by Greg Saville N7IDB

AEA's Weather FAX Decoder

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The AEA-FAX™ is a multi-intensity gray-scale FAX receiving system that works with IBM or compatible computers. Those of you who are familiar with AEA's PK-232 multimode TNC already know that its FAX capability is limited in that it can only decode two levels of brightness. While this provides reasonable results for simple line drawings like weather charts, it leaves a lot to be desired for true gray-scale transmissions such as satellite images or newswire photographs. The AEA-FAX system can decode 16 levels of gray, which provides very nice reproduction of satellite photos transmitted by the NOAA weather services when viewed on a VGA video monitor.

What Do You Get?

The AEA-FAX system includes a FAX demodulator adapter, software on both 3-1/2" and 5-1/4" disks, and a 28-page owner's manual.

The FAX decoder modulator resembles a large serial connector with male and female 25-pin RS-232 D connectors. One connector plugs in to one of your serial ports while the other side can accept another serial device (like a PK-232 or modem, but not a mouse) so both can share the port. When you're not using the AEA-FAX, your computer can still use the other serial device so you don't have to keep plugging and unplugging cables when you want to use the port for something else. The demodulator adapter has a 5' shielded audio cable with a standard 1/8" phone plug that connects to your receiver's remote speaker jack to provide the FAX input.

AEA thoughtfully includes their software on both sizes of disks, so you don't have to worry about being sure of getting the right version for your system and they don't have to worry about stocking two different versions.

The owner's manual is very well written and quite complete. It begins with a one-page "Quick Start Procedure" section for those of us who are most anxious to get up and running immediately. More details follow, including "Hardware Requirements," "System Overview," "Functions of the Components," "Installation of the Hardware and Software," "Running the Program," and "Capturing Live Data," plus a technical discussion of how facsimile transmissions work and more details of how to use the various software modes, with command summaries. Lastly, some weather FAX frequencies are listed, along with a short discussion of radio propagation considerations, a glossary, and illustrations of the system layout and examples of the various received waveforms as shown by the Miniscope function.

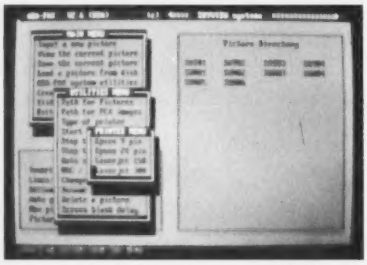

Photo A. AEA-FAX is menu-driven and mouse compatible for ease of use.

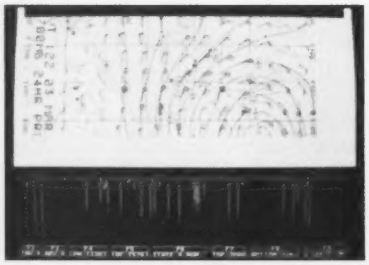

Photo B. Using the miniscope while capturing a weather FAX.

Photo C. Sample weather satellite image showing the high quality possible when viewing on a VGA screen.

Quick Start Procedure

Installation and setup was very brief and easy, thanks to the Quick Start Procedure. I just plugged the device into my COM1 port, plugged the audio cable into my TS-440, mounted the floppy disk in my system and typed: INSTALL. The install program creates an AEA-FAX directory on your hard disk and copies all the software to it. I started the program by typing: FAX, and then tuned in a FAX transmission. In just a few seconds a weather chart started to appear on my screen! While waiting for the image to complete, I read some more of the manual. As more of the picture appeared, I noticed that the image was somewhat slanted, but found instructions to adjust the timing to my system to provide perfectly aligned images. I found the program very easy to use: Windows and menus are provided for all functions, help screens are available and all selections can be made with arrow keys or a mouse.

You can find your way around and do just about everything without even needing the manual.

View Mode

Once a complete image is received, you can save it to disk for later viewing. To load a saved FAX, just select the "Load a Picture from Disk" menu item with the mouse or arrow keys. A directory listing of available pictures is displayed and you just click on the one you want. Next, you select "View the Current Picture" from the menu and the FAX is displayed. Several viewing options are available in view mode, including moving the picture left or right, scrolling up or down to see pictures larger than your display, mirror, flip, invert, zoom, print, color palette selection or edit, and a help function. Pictures can even be exported to .PCX Paintbrush file format for further editing or touch-up with PC Paint.

Input Mode

Capturing pictures couldn't be easier; the software automatically detects start and sync tones and adjusts itself for different FAX formats. It even automatically adjusts the gray-scale level decoding to the signal to ensure full gray-scale representation.

While in input mode, there are several commands you can enter including toggle invert, toggle reverse, lines per minute select, index of cooperation select, automatic mode, screen clear, resync screen, miniscope select and a help screen.

Miniscope

Proper tuning of your receiver to the FAX signal is vital for good results and AEA provides a handy way to adjust your receiver with the built-in Miniscope. Anytime you're receiving a FAX, you can select the Miniscope by pressing the "M" key. The screen splits and shows a spectrum analysis of the FAX signal in the lower window of the screen. In real time, you can watch the effect of tuning and volume

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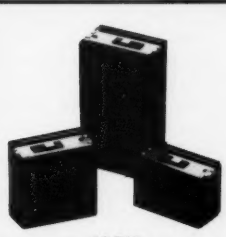

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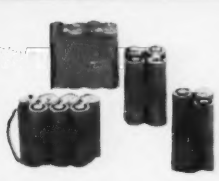

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Figure 1. Sample hard copy output of a weather satellite image as printed by AEA-FAX on a laser printer.

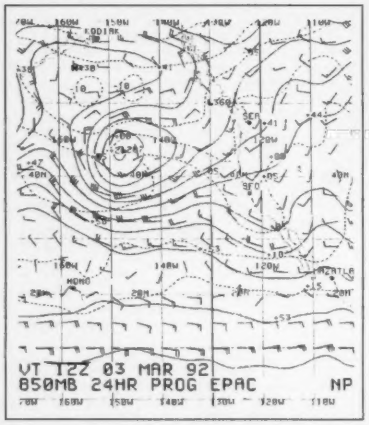

Figure 2. Sample hard copy of a typical weather chart as printed by AEA-FAX on a laser printer.

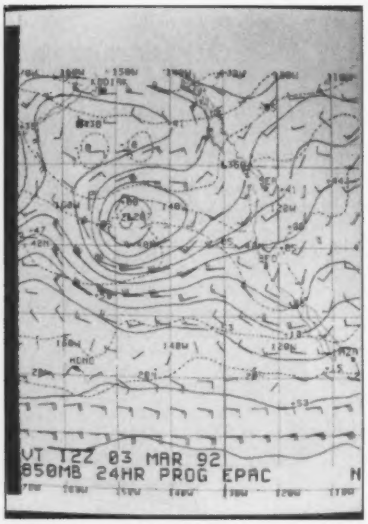

Photo D. A sample weather chart produced by the AEA-FAX.

level adjustments and select the settings that give you the best quality picture. I like the miniscope so well that I almost always leave it on.

Advanced Features

Watching an image slowly appear line by line is

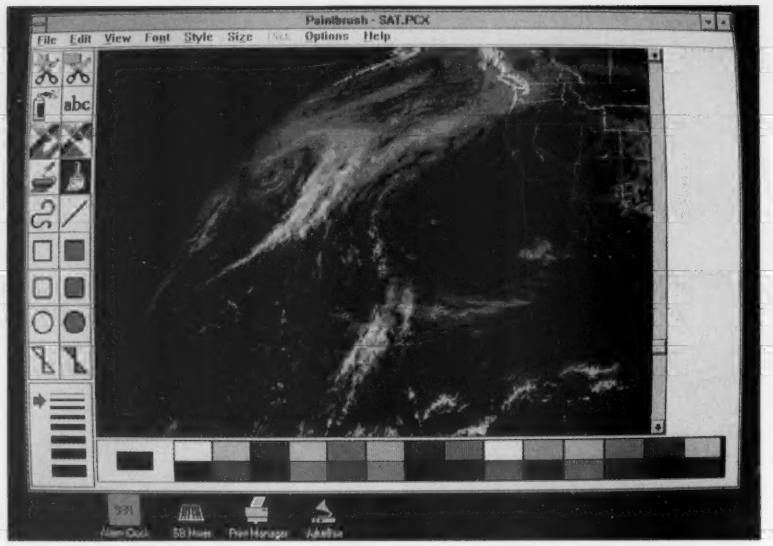

Photo E. AEA-FAX includes an image export utility that converts images to standard ".PCX" PC-Paintbrush format for editing and touch-up.

fun the first few times, but since it can take 10 to 15 minutes for a complete transmission, it becomes less exciting with time. This is where the unattended capture or "Autolist" feature is appreciated. The Autolist function allows you to capture pictures automatically while you're away from the system for viewing at a later time. Options allow you to program a specific timetable to collect just the images you want, as long as you know the schedule of the station you're listening to.

Entering a special time of 99:99 sets the Autolist feature to decode and save every FAX transmitted. This turns out to be my favorite mode.

Images can be printed on Epson 9- or 24-pin dot matrix printers or on Hewlett Packard compatible laser printers in 150 or 300 dots per inch resolution. I found that text or line drawings, like most weather charts, printed nicely, but multi-level grayscale photographs obviously can't be printed as well on a device that only has two color choices—black or white. In its best mode, the program dithers the image to provide nine gray levels at the expense of some resolution loss. While the printed images can't approach the quality of the on-screen views, they sure were a hit in my son's elementary school class when they were studying a unit on weather.

A neat slide show utility is provided, which is a great way to show off your best images. This mode allows you the ability to display a series of cloud-cover pictures like they do on the 11p.m. TV news.

The utilities menu offers a number of file handling and capture functions including setting up a default directory for file operations, printer selection and options, start and stop tone threshold, stop tone frequency, auto sync delay, display shades, menu screen colors, and even adjustment for a built-in screen saver mode.

Suggestions

While I'm really impressed and satisfied with the unit, there always seems to be something minor that can be improved. I'd like to see an easier way to start the autolist unattended capture function. As it is now, you need to select the autolist menu option and type in several parameters, exit, and then start autolist with ALT-L. I'd like to see a simpler setup where you just select a menu item that starts decoding and saving all files right away with some default, yet unique file names. It would also be nice if there was a way to load and view a file in one step, like maybe double clicking on the file name. As it is now, you first select the load function, select the file you want to load, then select the view function. This gets tedious if you have 30 or so new files you'd like to quickly scan through.

Being the tinkerer that most hams are, I'd also like to see a schematic diagram for the demodulator circuit. It's a pretty simple, yet clever, circuit that taps its voltage from the RS-232 control lines and does an amazing job of decoding analog levels through a serial port!

One other minor suggestion has to do with the product packaging. The box contains a little compartment for the disks and I noticed that my 3-1/2" disk fits pretty snugly, enough so that the floppy disk case is now permanently distorted. Not enough to prevent the disk from spinning, but it doesn't look like it would take much more to cause trouble. I've decided not to snap the disk back into its compartment for storage.

Lastly, I think a nice follow-on product would be another program or software upgrade to use the demodulator circuit to decode and display SSTV pictures. It seems the hardware is capable; it would just take some additional software to display it properly.

Do I Like It?

I have thoroughly enjoyed playing with the AEA-FAX system and especially like seeing the ever-changing cloud patterns from the satellite photos. The software is quite good, easy to use, and hasn't exhibited any bugs. For the enjoyment value alone, I feel quite satisfied. For someone who really needs access to the various weather information available, the cost is very reasonable. 73

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HI-MOUND TELEGRAPH KEYS

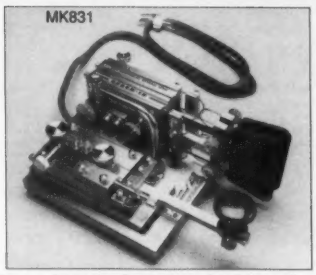
FEATURES

MK802 – Hand Key Type
The MK802 has good harmony on a classic wooden base with a brass handpiece.

•Dimensions (LxW): 5.12" x 2.76"
•Total Length (incl. keyer): 7.36"

MK831 - Deluxe Compound Key
The MK831 features unified manipulator and vertical key. Operating lever width of manipulator can be adjusted. Soft or hard operational sense can be chosen.

•Dimensions (LxW): 5.12" x 5.71"
•Total Length (incl. keyer): 7.28"



ADJUSTMENTS
• Knob Position • Pressure • Gap

The MK802 is a true instrument, not just another "straight key". This well designed key is fully adjustable so you can custom tune it for your fist. This finely crafted, beautifully finished key was machined, not stamped or cast as a mass produced item.

Order #	Price	Description	Weight
MK802	230.00	Telegraph Hand Key	2.5 lbs.

The MK831 compound key is without a doubt the finest example of the radio-telegrapher art. This beautifully designed and finished key set would be the pride of any well equipped station, and a joy for the operator. The fully adjustable features allow custom tuning to the operator's fist. A wonderful gift or a most appreciated presentation item.

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SINGLE LEVER IAMBIC

NEW

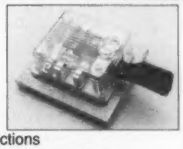
FEATURES
•Gold plated contacts
•Black and chrome color
•3 binding posts for connection
•Fully adjustable for contact gap and tension
•Dimensions (LxW): 6.06" x 3.31"

Single lever key designed for use with an electronic keyer. It provides circuits for dot and dash (SPDT), and is mounted on a heavy base with rubber inserts so that it won't "walk" around your desk. It features dual-point, frictionless ball bearing pivot suspension with preload adjustment.

Order #	Price	Description	Weight
MK701	68.95	Straight Telegraph Key	2.1 lbs.

IAMBIC KEY

MK706 Shown With Base



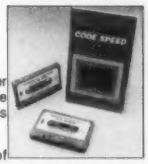
FEATURES:
•Silver and chrome color
•3 binding posts for connections
•Fully adjustable for contact gap and tension
•MK706 mounted on 5/16" steel base-plate with rubber feet
•Dimensions (LxW): MK704–3.31" x 2.6"
MK706–3.94" x 3.54"

Double lever iambic key designed for use with an electronic keyer provides simultaneous dot and dash contacts. It features dual-point, frictionless ball bearing suspension with preload adjustment.

Order #	Price	Description	Weight
MK704	47.50	Iambic Telegraph Key w/o Base	8 oz.
MK706	64.50	Iambic Telegraph Key w/ Base	1.9 lbs.

MORSE TRAINER TAPES

ARRL Morse Trainer Tapes



When it comes to the code, whether you're just starting out or you're working on your Extra Class upgrade, practice makes perfect!

The ARRL produces five sets of Morse code tapes to get you from 0 to 22 words per minute. Each set includes two C-90 cassettes.

Introduction to Morse Code, a cassette program for beginners makes learning the code fun. It teaches you all the characters and provides plenty of practice.

Order #	Price	Description	Weight
AR3487	10.00	Introduction to Morse Code	3 oz.
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AR2235	10.00	Set 2 - Practice Tapes 10-15wpm	3 oz.
AR2243	10.00	Set 3 - Practice Tapes 15-22wpm	3 oz.
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MOBILE ANTENNAS

144/440MHz

FEATURES – HG1100
•Dual Band: 144/440MHz
•Connector: UHF Plug
•Coreless matching coil
•Heavy gold plated connector pin

FEATURES – VM2HP
•Connector: UHF Plug
•Coreless matching coil
•Triple bright finish element
•Heavy gold plated connector pin

FEATURES – VM720B
•Dual Band: 144/440MHz
•Connector: UHF Plug
•Coreless matching coil
•Smooth bright black finish
•Universal hatch/trunk mount
•12' RG58 type cable with 8" RG188 1/8" dia. cable at the mounting end (won't damage car's weather strip)

HG1100

144MHz

VM2HP

144/440MHz

VM720B

Order #	Price	Description	Weight
HG1100	69.50	Hi-Power Mobile Antenna	8 oz.
VM2HP	43.50	2 Meter Mobile Antenna	9 oz.
VM720B	49.50	Dual Band Mobile Antenna	1.06 lbs.
VM720K	99.50	Mobile Antenna & Cable Set	2.06 lbs.
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CIRCLE 9 ON READER SERVICE CARD

73 Review

by David Cassidy N1GPH

The Larsen KG 2/70 Glass-Mounted Antenna

Larsen Antennas
P.O. 1799
Vancouver WA 98668
Telephone: (206) 944-7551;
(800) 426-1656
Price Class: $85

Until very recently, I have always driven what could be kindly referred to as "klunkers." While all of my friends were taking out huge loans to get the latest and greatest offering from Detroit or Tokyo, I was stuck with whatever the used car salesman thought he could dump on me.

For a ham, there *is* one advantage to driving an old, beat-up car: You never have to worry about attaching any kind of antenna to it. Since there is no way to harm a car that is already overdue for the junkyard, you can drill, attach, fasten, hang and install to your heart's content.

All of this changed for me when I finally bought my first never-before-driven, "0" on the odometer, brand-new car. It's a little red coupe, and the last thing I wanted to do was slap a mag-mount on that shiny paint, or stick some aerial monstrosity on the trunk lip. Since I wanted to operate both 2 meters and 440 MHz, I needed a dual-band antenna. Also, since I live in a very hilly area of the world, I wanted a bit more signal punch than your average quarter wave. Of course, the answer to a new-car owner's prayers is a through-the-glass antenna, but a few calls to the various mail order companies soon confirmed my worst fears: Nobody makes a dual-band, glass-mounted antenna. I swallowed my pride, opened my wallet and was soon dragging along a very nice, but very ugly, dual-band antenna—complete with what looked like a military-issue trunk lip mount (actually, it was a high-quality piece of hardware from a very well-known company, but the high loan payments for the new car had clouded my judgement).

Not long after I broke down and installed the trunk-mounted antenna, Larsen started advertising their new KG 2/70 dual-band, glass-mounted antenna. A few phone calls and one more trip to my wallet for the credit card later, I was the proud owner of a dual-band, glass-mounted antenna.

The KG 2/70

The KG 2/70 is a sleek-looking, unobtrusive antenna. With its black polyurethane coating and the exposed coil-in-the-whip design, it looks like a cellular phone antenna on steroids!

Electrically, the KG 2/70 is a half wave on 2 meters and a collinear on 70 centimeters. No ground plane is needed (go look it up, if you want to know why), and Larsen claims gain of 2.5 dBd on 2 meters and 4.5 dBd on 70 centimeters.

The antenna is pre-tuned to provide a 1.5:1 SWR. Minor adjustment is provided by moving the whip up or down about 1/2 inch and securing it with a setscrew. I found that this adjustment had minimal effect on the SWR, so I left it as it came from the factory—fully inserted.

Installing the KG 2/70

Installing the KG 2/70 takes all of about 10 minutes. Everything you need is included, and the step-by-step instructions are quite clear.

The only trick to installing any glass-mounted antenna is making sure the glass is at room temperature. (Since I ordered the antenna around Thanksgiving and I don't have a garage, I waited until April!) The only other precaution is to make sure your window is clean, both inside and out. Ignore either of these precautions and you may find yourself dragging your antenna down the highway someday.

After deciding where you want to mount the antenna (usually the upper edge of the back window), all you do is clean the glass, swab the surface with the supplied alcohol pad (to get the glass *really* clean), measure and mark with a pen (so you get it right where you want it), apply the supplied adhesive, peel off the backing on the mounting plates (one for the inside and one for the outside), and press. I would suggest that you peel off the backing paper from the mounting plates *before* applying the liquid adhesive to the window. This stuff dries very quickly, and you don't want to be fumbling with the backing paper while it does.

Once you have the plates stuck to the inside and outside of your window, the only thing left to do is run the coax (a few press-on coax clips are supplied to help route the coax along the top of your window), solder on the supplied PL-259 and attach it to your rig. Your initial thought upon seeing the supplied but unsoldered PL-259 may be, "Those lazy @#+%&s! Couldn't they have installed the lousy plug!" After a few moments, you'll also realize how much easier it is to route the coax through your vehicle *without* that bulky connector hanging up on everything. Wait until you're done routing the coax to the rig, *then* solder on the PL-259. It will save you time and skinned knuckles.

On The Road

Photo A. the Larsen KG 2/70 mounts directly on glass.

The true test of any antenna is how it works in real-world conditions (I probably wouldn't feel this way if I had an antenna test range, but I don't). I set up an A-B test between the KG 2/70 and the top-quality dual-band antenna I had been using.

The KG 2/70 turned in almost identical performance to my other dual-band antenna. When you consider that the antenna isn't *physically* connected to the radio, this is pretty amazing. In fact, the KG 2/70 was a little better on transmit. This was probably due to the fact that the KG 2/70 was mounted at the very top of my rear window, while my other antenna was attached with a trunk lip mount, placing a major portion of the antenna element below the roof line.

On the receive side of the coin, I didn't notice any difference at all, but in another A-B test between the KG 2/70 and a 2 meter 5/8-wave mag-mount, the KG 2/70 provided a noticeable increase in the receive range (about two S-units).

Conclusion

I am quite pleased with the performance of my KG 2/70. If you were ever disappointed by earlier experiences with capacitively-coupled, glass-mounted antennas, you should give this new antenna a try. I have to admit that I was never impressed with the performance of glass-mounted antennas. Sure, they worked OK, but they were a compromise between aesthetics and performance. The KG 2/70 lets me have my cake and eat it too!

. . . and it looks cool on my little red car! 73

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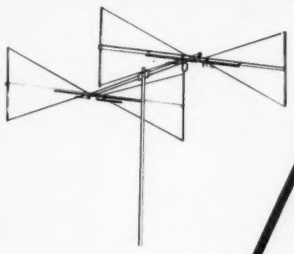

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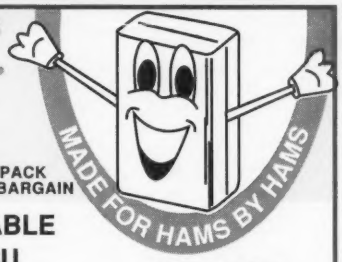

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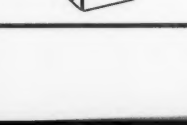

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CN-520

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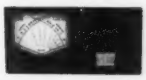

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CN-101	1.8-150MHz	15/150W/1.5kW	SO-239
CN-103	140-525MHz	20/200W	SO-239 or N
NS-660A/PA	1.8-150MHz	30/300W/3kW	SO-239
NS-663BM/BN	140-525MHz	30/300W	SO-239 or N
Digital			
DP-810	1.8-525MHz	0-1.5kW/0-15W	SO-239 or N
DP-820	140-525MHz	0-150W	SO-239 or N
DP-830	1.8-150MHz	0-1.5kW	So-239
Mobile			
CN-410M	3.5-150MHz	15/150W	SO-239
CN-460M	140-450MHz	15/150W	SO-239
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Current (ICS)	12A	14A	30A	33A	40A
Current (cont.)	9.2A	12A	24A	30A	32A
Ripple (max.)	3mV	3mV	3mV	3mV	3mV
Regulaiton	1%	1%	1%	1%	1%
Cooling Fan	NO	NO	NO	YES	YES
Size (inch)	5x4x9	5x4x9	7x6x9	7x6x9	11x5.5x9
Weight (lb.)	11	11	16	21	22

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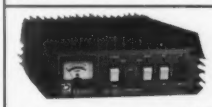

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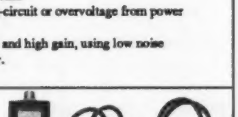

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EDCO

A Frequency Counter Upgrade

Accuracy at the flip of a switch.

by James Flynn KD9ZT

Many hams have a frequency counter as part of their station, or for use as a test instrument. If you're in this group, I'm sure you wonder how accurate your counter is. Frequency is often a point of argument among amateurs, and discrepancies exist. In this article, I'll explain an inexpensive modification, adaptable to almost any counter, that I used to make a highly accurate and stable instrument.

Frequency Counters

A short review of frequency counter operation will show the cause of inaccurate displays. "Timebase" refers to the length of time (usually 1 or 0.1 second) that an electronic "gate" allows for the unknown input signal to reach the counters. While this gate is open, the cycles of the unknown signal are counted. When the gate closes, the count is displayed on the front panel, circuitry is reset, and the gate re-opens for a new count. Obviously, if the gate remains open for too long or too short a time, the counter will err high or low, respectively.

If the unknown signal happens to be 146 MHz, for example, a gate-timing error of only one-millionth of a second would produce a count error of 146 Hz. To achieve such precision may seem unthinkable, but frequency division makes it possible. Most counter timebases are generated by dividing the frequency of a crystal oscillator running at several MHz down to 1 Hz. As the frequency is divided, so is the frequency error. The oscillator may be off several kHz, but after division by several million, the error becomes minute. Still, extreme precision is essential, and crystal oscillators are prone to drift with time and temperature, leaving timebase accuracy in question.

My counter is an inexpensive Heathkit IM-2410, purchased for tune-ups, tinkering, and repair work. I soon realized that warm-up drift of the unit was substantial, amounting to 500 Hz on the 2 meter band over a two-hour period. I was dissatisfied with such dubious accuracy, and began pondering ways to modify the timebase oscillator for better stability. A crystal oven or a substitute timebase frequency source seemed logical choices.

Selecting Your Standard

Probably the most stable oscillator available to an amateur is a surplus frequency standard, a proportionately controlled, oven-sized, crystal oscillator. Companies such as CTS Knights produced these units for the US military. They are generally available at hamfests, and I have seen them in a surplus house catalog. I obtained a Knights standard, and began the project of adapting it to my counter as a substitute timebase oscillator.

The Knights frequency standard is housed in a plated brass can 2" x 2" x 5" long. All connections are made at the bottom through an octal plug/socket. Removing a threaded plug from the top of the can exposes a piston trimmer capacitor, used for precise frequency adjustment. This unit has a frequency output of 1 MHz at approximately 4 volts rms. Once temperature and frequency stability are achieved, drift is specified as no more than one part in 10^8 per day. Actual drift will likely be much less. It requires 28 volts DC at approximately 0.2 amps. Cold start-up current may reach 0.5 amps due to high demand by the heating element. Standards made by other manufacturers may have different outputs and power requirements.

The Heath IM-2410 timebase frequency is generated by an adjustable 3.579 MHz crystal oscillator/divider, V10 (Figure 1). V10 output frequency is 60 Hz. Driver transistor Q6 provides a suitable waveform to U8, a divide-by-six with 10 Hz output. These 1 and 10 Hz frequencies are routed from a front panel switch to the signal input gate circuitry to allow selection of a 1 or 0.1 second gate.

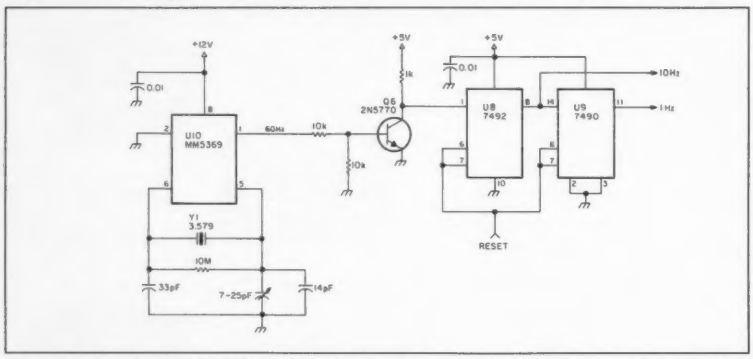

Figure 1. The Heath IM-2410 timebase frequency is generated by an adjustable 3.579 MHz crystal oscillator/divider, U10.

Designing the Modification

It's apparent from the Heath circuit that 10

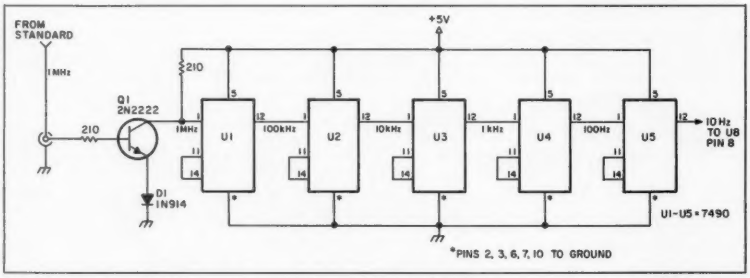

Figure 2. To build this curcuit, you only need five 7490 decade counter/dividers and a piece of perfboard.

Hz would be an ideal substitute frequency to inject into the timebase generator. With 1 MHz available from the Knights standard, I needed only to divide by 100,000, or equivalently, to divide by 10 five times. I bought five 7490 decade counter/dividers and a piece of perfboard to construct the circuit in Figure 2. The chips are wired in series divide-by-ten. The Q1 transistor stage was necessary to shape the sinusoidal output of the frequency standard into a shape resembling a square wave, with the steep edges necessary to reliably trigger the first divider.

Diode D1 accomplishes this task by holding the transistor in cutoff until the 4 volt sine wave applied to the gate reaches about +1.4 volts. This is the combined voltage drop of D1 and Q1 base-emitter junction. At this point the transistor turns on sharply, giving a steep leading edge to its output waveform. The reverse occurs on the falling edge of the sine wave. A second diode in series with D1 would "square" the output waveform even more, but it was unnecessary in this case. Note that the input waveform must be of ample voltage to overcome the voltage drops of Q1 and any emitter diodes. Had the output of the frequency standard been insufficient, a preamp stage ahead of Q1 would have been necessary to boost voltage.

The next task was to mount the perfboard inside the Heath cabinet. Finding no likely place for nut-and-bolt mounting, I soldered two #16 wire "legs" to the perfboard, positioned to match areas of ground foil on the Heath board. I soldered the legs to the ground foil, supporting my assembly above the main counter circuitry. This type of mounting appears entirely adequate for small structures. I took +5 volts directly from the Heath regulated bus. Interfacing to the IM-2410 was simple—I removed U8 from its socket and plugged the substitute frequency from my divider into the pin-8 (output) position of the U8 socket.

Next, I mounted the frequency standard onto a 5″ x 6″ x ⅜″ board, which left adequate room for a companion 28-volt power supply. I used a Radio Shack miniature 24-volt transformer. The rectified, filtered DC output is about 34 volts. A simple Zener diode-controlled pass transistor lowers voltage to the 28 volt requirement. Power supply circuit descriptions are readily available from many sources, so I will not go into detail. Good supply regulation is not necessary, as the Knights standard has precise voltage regulation internally for critical circuitry. A 24-volt wall transformer would likely suffice, although I haven't tried one.

I mounted this assembly on top of the counter with ¼″ standoffs to avoid blocking ventilation holes. The 1 MHz input frequency is fed to the divider inside with RG-174 minicoax, through a ⅛″ phone jack installed in the cabinet rear panel. You could also place the standard apart from the counter and use a longer feed cable. To avoid an additional 115 volt supply cord at my station, I wired the power supply transformer primary through a strain relief in the counter's rear panel to 115 volts points inside, so that the Heath line fuse also protects the transformer. The 28-volt supply and the frequency standard are always powered, unaffected by the counter on-off switch. Reassembling the cabinet completed installation, and a quick check confirmed that the counter was operating normally.

Calibrating the Standard

Calibration of the frequency standard is quite easy. Install a coaxial "T" fitting in the feedline of one of your HF antennas at your operating position. Tune your SSB rig to WWV at 10 MHz, then move up a few hundred Hz to hear a tone from their carrier. A sharp CW filter helps give a cleaner tone, reducing modulation effects. Feed a sample of the 1 MHz frequency standard output through a 100 pF capacitor to the coax "T." The tenth harmonic of the 1 MHz frequency will beat noticeably with the WWV carrier. Use a miniature screwdriver to adjust the output frequency of the standard.

As this frequency nears zero beat, the S-meter will deflect 2–4 units with each beat, and beats will be audible in headphones or speaker. It helps to calibrate the standard during periods when QSB on WWV is at a minimum. With a little practice, one beat every other second can be achieved. More accurate calibration becomes difficult due to confusion with QSB, but it is by no means necessary. A beat every two seconds is equivalent to ½ Hz error at 10 MHz. This extrapolates to a 7 Hz error on the 2-meter band, and to a 23 Hz error at 450 Mhz. Few counters can approach this accuracy.

Maintaining Accuracy

With this particular standard, I've noticed that a "stabilization" period is necessary each time the frequency trimmer is moved. I don't know if this is typical. I usually wait several hours to check the results of each adjustment. But once calibrated, months go by without frequency checks. It just isn't necessary. The frequency standard runs along most dependably. My counter never leaves the shelf, but one that is subjected to rough use would probably require periodic frequency checks to maintain the accuracy stated above.

This may be my most worthwhile homebrew project to date. It is very enjoyable to have accurate frequency measurement capability at the flip of a switch—without warm-up, without drift. If you have the frequency counter "doldrums," investigate adapting this procedure to your counter.

W9ZTK deserves credit for the technical specs of the Knights frequency standard, as well as my thanks for his help in making this project a reality.

A limited supply of 10 MHz frequency standards (EG&G model T-424, 12 VDC) are available for $16 ppd. from Chuck Houghton WB6IGP, 6345 Badger Lake, San Diego, CA 92119. To use these modules with the circuit in Figure 2 you will have to add on an additional 7490 decade divider. FJ

You may reach James Flynn KD9ZT at Box 32, Dana IL 61321.

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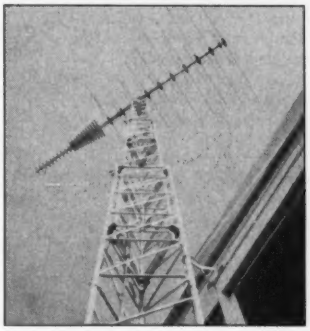

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Video Ins and Outs

If you have a computer in your shack, you've probably thought about using it to capture and display a still-frame image of your ATV contacts. Once you have that special image in your computer, you could label the image with the time and date of reception and actually start a video logbook! Not only that, you could snap a still-frame of yourself, label it with your callsign using any of several drawing programs, and use this for your video ID. Getting that priceless video image into your computer is of particular interest to those of you who are using a computer for slow-scan TV (SSTV).

Up until recently, the only way you could snatch a video image into your computer was through the use of very expensive digitizers. Fortunately, there are a number of fairly inexpensive boards and interfaces now available that won't cost more than your computer! There are quite a few to choose from, and this is not a list of all that is available by any means. However, I'd like to discuss a few of the inexpensive boards I've run across that I think will be of particular interest to ATVers and SSTVers.

Black and White Digitizers

The least expensive boards are those that will do only black and white images. Depending on your needs, these boards are certainly the most affordable way to digitize your video image into your computer.

The SV1000 Video Digitizer

For just $89.98 + $5 shipping, you can obtain a small board that plugs into your computer's parallel port. It comes without a case and requires you to strap a 9-volt battery onto the board for power (you can leave the battery attached since it is only used for power during the brief period of time a capture is being performed). A BASIC program is included in the package that allows you to capture a black and white video image in anywhere from 10 to 20 seconds, depending on the resolution you require. The digitizer provides either 640 by 480 or 320 by 200 resolution and will operate with any IBM PC or compatible from an 8088 to a 80386 with a CGA, EGA or VGA display. The program allows you to vary contrast, brightness and sync via software control to obtain the best image. The image is digitized in 256 shades of gray, which results in a very high quality image. The SV1000 and its companion program are available from Frank Lyman at Colorburst, P.O. Box 3091, Nashua NH 03061; phone: (603) 891-1583.

The Ventek VIP 640M

Coming in at $129, the Ventek VIP 640M is a black-and-white digitizer that plugs into an internal slot in your XT computer (the VIP 640M/AT, priced at $149, is for use in an AT machine). These digitizers take about 1/3 of a second (1/5 second for the AT version)to capture the image (operating as a line grabber) and digitize the image with 256 shades of gray with a resolution of 680 by 480 pixels. A PAL version is also available.

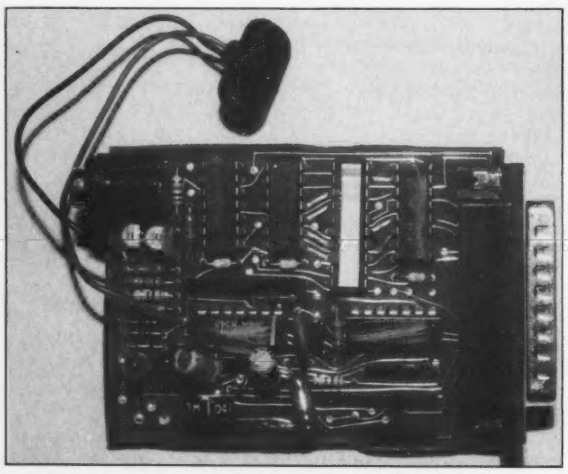

Photo A. The SV-1000 monochrome video digitizer from Colorburst.

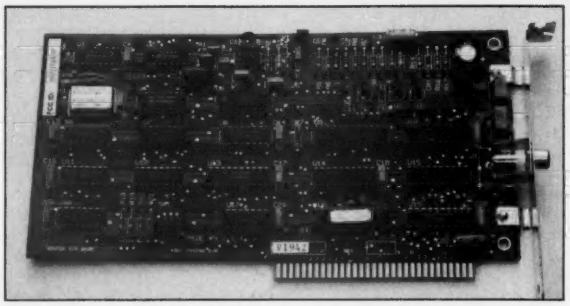

Photo B. The Ventek VIP 640M monochrome video digitizer.

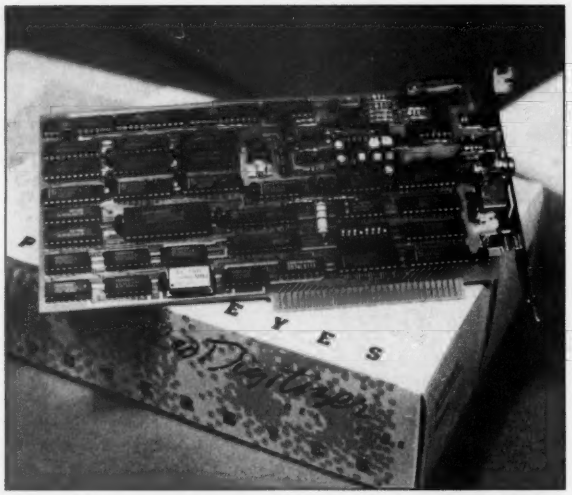

Photo C. The ComputerEyes R/T color frame grabber board from Digital Vision, Inc.

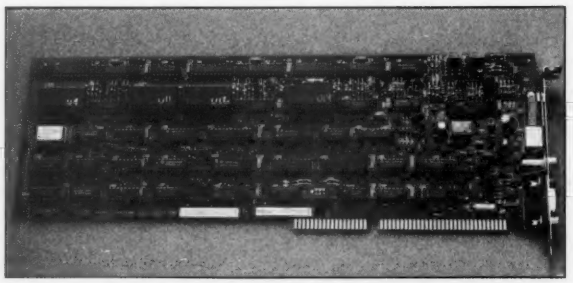

Photo D. The Ventek VIP 640C color video digitizer.

The VIP 640M comes with some very powerful software that allows you to get the most out of the digitizer and to store the image in all popular file formats. You also get a program called "Picture Publisher" that allows you to modify, edit and manipulate the image. For more information, contact Teri Csellak or Mark Montana at Ventek Corporation, 31336 Via Colinas, Suite 102, Westlake Village CA 91362; phone: (818) 991-3868 or FAX: (818) 991-4097.

ComputerEyes B/W

Digital Vision, Inc. offers a monochrome board that will digitize an NTSC or PAL video image for $249.95 that plugs internally into your PC. It captures a 640 by 480 pixel image with 64 gray levels. It takes from six to 12 seconds to complete a capture and will support Hercules, CGA, EGA, VGA and Super VGA displays. Its companion software allows you to display the image in a variety of modes: high contrast, gray scale, dithered grays and false color. In addition, extensive enhancement routines allow you to adjust brightness and contrast, and to sharpen, smooth and halftone the image. All popular image file formats are supported. For more information, contact: Digital Vision, Inc., 270 Bridge Street, Dedham MA 02026; phone: (617) 329-5400.

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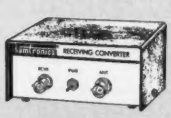

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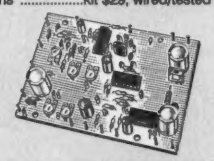

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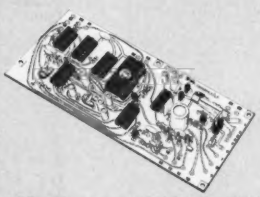
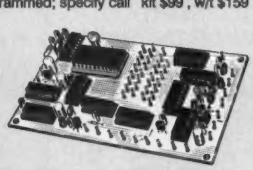


COR-4 kit. Complete COR and CWID all on one board for easy construction. CMOS logic for low power consumption. Many new features. EPROM programmed; specify call kit $99 , w/t $159



TD-2 TOUCH-TONE DECODER/CONTROLLER kit. Full 16 digits, with toll-call restrictor, programmable. Can turn 5 functions on/off. Great for selective calling, too! .....kit $89, wired/tested $149

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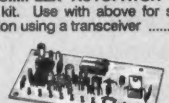

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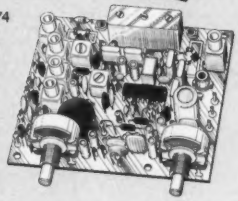

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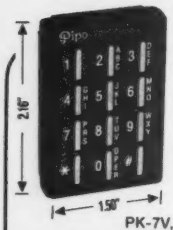

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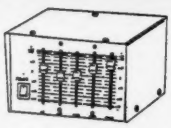

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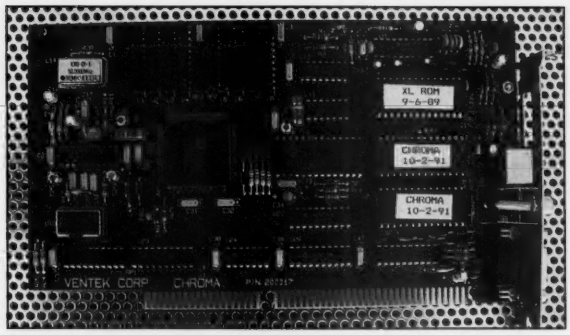

Photo E. The Ventek CHROMA VGA display board capable of 32,768 colors (HiColor mode) comes with an NTSC video output.

Color Video Digitizers

If you want the ultimate in video digitizers, particularly if you already own a VGA display, you might as well go for a full-color digitizer. Although more expensive, I think you'll find the results to be impressive enough to make the extra expenditure very worthwhile.

The Ventek VIP 640C

At $299, this is one of the most reasonably priced color digitizers (a PAL version is also available, model # 640 CP/AT.) You get a high-quality system that plugs inside your computer which is capable of capturing a 640 by 480 pixel image with over 16 million colors and 256 gray levels. It does this in less than a second. You can capture the image in either a 24-bit/pixel or 8-bit/pixel color mode, or even as an 8-bit/pixel monochrome mode depending on your needs. As with the VIP 640M monochrome board, you get a powerful software package that allows you to correct color, mask, cut, spray, or enhance the image as well as to create a collage effect with several images. In addition, you can use their FOTOfiler image database management software to store your image in an image database that is fully dBASE file compatible and allows easy retrieval and display of the stored images (perfect for an ATV logbook).

ComputerEyes/Pro

Priced at $399.95, this is the color version of the Digital Vision, Inc. ComputerEyes B/W board. It is capable of capturing a 24-bit (16 million colors) image and allows you to reduce the image to an 8-bit, 256 color mode on-the-fly. It takes from 1.5 to 24 seconds to digitize an image. It supports all common image file formats and an optional developer's package is available for incorporating scanning routines within an application.

ComputersEyes/RT

All of the previous digitizers we've discussed so far were only capable of digitizing an image if the subject holds still for anywhere between 1/5 of a second to as much as 24 seconds. This is OK if you have a good still-frame mode on your VCR, but the ultimate is to have a *frame-grabber* video digitizer. This allows you to capture just a single frame of video (1/30th of a second) in real time. Unfortunately, this kind of capability increases the price of the digitizer to the point where it is almost as expensive as the computer! Still, for those who want to snatch some live-action video, you might want to investigate the ComputerEyes/RT, priced at $599.95. This board allows you to frame-grab the image in a resolution of 512 by 512 pixels with a full 24-bits (16 million colors).

VGA to NTSC

One of the most frustrating problems among ATVers who own a computer is the inability to accurately show off their latest computer graphics and programs. The video format of most computers is NOT NTSC compatible (scan rates can be radically different) and can not be transmitted directly over the air. The only solution is to point your TV camera at your computer monitor and hope for the best. You get reasonable results by doing this, but some output formats cause an annoying flicker due to the scan rate differences, and the colors never come out quite the same. Wouldn't it be great to have a video-out jack on the back of your computer that you could just plug directly into your ATV transmitter?

Well, up until recently, that feature entailed an expensive card that would cost in excess of $500. Now there are some alternatives that are cost effective.

The Ventek CHROMA Display Board

For those of you wishing to upgrade your system to a VGA display, and particularly one with the new Hi-Color mode capable of 32,768 colors, you might want to investigate the new Ventek CHROMA HiColor VGA display board. This unique VGA board has an NTSC output built right in and comes in at a very economical $369. For more information contact: Ventek Corporation, 31336 Via Colinas, Suite 102, Westlake Village CA 91362; phone: (818) 991-3868 or FAX: (818) 991-4097.

Photo F. The TelevEyes module by Digital Vision, Inc. allows you to convert your existing VGA display into NTSC video.

The TelevEyes Converter

Priced at $299.95, this is a separate module from Digital Vision, Inc. that hooks inline between your computer and your monitor. This converter gives you an NTSC video output using your existing VGA display. For more information contact Digital Vision, Inc. at 270 Bridge St., Dedham MA 02026; phone: (617) 329-5400 or FAX: (617) 329-6286.

Digital Views

This is just a sample of some of the more economical systems that may be useful for the ATVer. Now that getting the video in and out of the computer is much easier, I expect that it won't be too long before we see some interesting new hardware and software that will allow you to process video in real time.

Look for some affordable special effects and image processing applications for your home computer that will rival that of commercial television in the near future. 73

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T-Hunt Trickery

Jammer tracking, noise location, search and rescue—there are many reasons why hams get into radio direction finding (RDF). But no matter what your purpose, you'll find it takes experience in the field to become proficient with your equipment. Fortunately, practicing is lots of fun when you get together with fellow RDFers to hold hidden transmitter hunts, usually called T-hunts or foxhunts.

Hams sometimes ask, "What's so tough about T-hunting? You just take a bearing, plot it, and follow it to the T. No problem!" Either these people haven't done much hunting, or they're incredibly lucky, or they have never gone up against a worldclass hider.

Even in the simplest hunts, one or more teams usually become completely baffled at some point. And when the goal is to bamboozle everyone, there is no end to the stunts an imaginative huntmaster can employ.

Dirty Tricks 101

Most "Homing In" columns provide tips for the hunters. To even the score, it's time to help hiders prolong the suspense and the fun. But don't let the title fool you—you don't have to do anything illegal or unsafe to put on a tough hunt. Just use your ingenuity.

When a T-hunt is a real challenge, everyone benefits. The hider gets the satisfaction of knowing that the winners are working for their reward. The hunters gain valuable experience that may be useful on an RDF search/rescue effort, when lives are at stake.

Most RDFers I know would rather be foxhunting than doing any other ham activity. So the longer the hunt lasts, the more fun they have that day!

Devious hiding tricks fall into four basic categories:

1. Deceptive signal parameters
2. Inaccessibility
3. Indirect signal paths
4. Concealment and camouflage

We'll limit the discussion to category #1 this month, and confine it to single-transmitter VHF events where the hunters are mobile.

Typical rules for beginners' hunts call for the fox to transmit a continuous carrier with constant power and antenna polarization. If the hunt is held on a repeater input, the hider may transmit for 15 seconds, then be off for a minute or so.

To advance to a higher degree of difficulty, try sending very short bursts of signal (if permitted). WA6FAT turned an easy hunt into tricky one on a rainy night when he put the T in a replica of a medieval tower, transmitting for a fraction of a second every few seconds.

If hunt rules allow it, vary the hidden transmitter power. This is particularly hard on hunters using a beam, attenuator, and S-meter to get bearings, because that method relies on constant signal level for its accuracy. On the other hand, variable signal strength will not affect doppler or time-difference-of-arrival RDF sets, so long as the signal exceeds the set's minimum sensitivity threshold.

If you don't mind waiting a long time for the hunters to arrive, and are prepared to be the object of their outrage, combine short transmissions with varying power. This gimmick was used a few years ago at a convention hunt in San Diego, where expensive prizes were at stake. The hider, wanting to separate the skilled hunters from the lucky ones, set up the T to cycle on and off every half second, with each transmission at a different power level, randomly selected.

Not to be outdone, John Moore NJ7E built a microprocessor-based controller for an all-day hunt in the Phoenix area last fall. His fox-box generated random transmission lengths, random time between transmissions, and random power levels.

Antler Antics

If rules allow it, use creativity in your antenna system. Horizontal signal polarization is tough on hunters with dopplers or other sets with vertical whips. When you hunt a cross-polarized T, the direct signal is attenuated, while bounces from buildings and terrain features tend to stand out. With any luck, the contestants will spend valuable time chasing reflections.

Every so often, a fox uses circular polarization. Depending on the terrain, it can confound the hunters. Get out the OSCAR antennas and try it!

If you have unlimited real estate available at the hiding site, try a setup like the one in Photo A. It shot lots of signal down the canyon, where it was several miles to the closest road. But it gave very little signal to the rear, where the road came within only a few hundred yards.

How about a moving antenna? Peter Emster WA6TQQ adapted a motorized camera pan-tilt mount to slowly change the polarization of his yagi from vertical to horizontal and back again, giving a very interesting effect. Wes Printz KA3DSE made a similar setup using a windshield wiper motor.

Other hiders rotate their beams in azimuth, to "light up" the nearby hills in various directions. If you're with the T, you can turn the antenna manually. For an unattended setup, add a motor, as shown in Photo B. Use a mechanism that sweeps the beam like an oscillating fan instead of making it go in circles, so you don't need slip rings in the coax line. The antenna should move slowly so that the effect is not too obvious.

Photo A. Gary Holoubek WB6GCT (pictured) and Tony Levand KA9WGO assembled this 16' long circularly polarized beam with a 6' x 6' screen reflector in a wilderness park for a Fullerton Radio Club T-hunt. It put lots of RF at the far end of the canyon, but very little signal at the road just behind it.

Stay tuned for more dastardly hiding ideas in future columns. Let's also hear about what you have hidden and hunted. Send stories of your local foxhunts to the address above. Photos are welcome, too.

Convention Fun

You say there are no T-hunts in your area, and you have never had a chance to lay eyes on any RDF gear or see how hunting is done? Consider coming to the ARRL National Convention, August 20-23, near Los Angeles International Airport. Not only is T-hunting on the technical program agenda, but there will be an abundance of hunts, put on as official convention activities by the Fullerton Radio Club.

Don't be surprised if you see hunters "sniffing" in the aisles. They will be seeking the miniature fox-boxes scattered throughout the convention center. If you find one of the official T's, you'll win a nice trophy to impress the hams back home. Portable RDF gear will be useful for this pursuit, but not mandatory. You might get lucky and find a T with just your 2 meter handheld, using the "body shield" technique.

There may be a few unofficial signals to hunt, too. The T-hunters of Southern California will probably bring all their toys, including foxes of all shapes and sizes.

For intrepid do-or-die mobile T-hunters, there will be a no-boundaries Southern California style mobile hunt on Sunday, with some very worthwhile prizes up for grabs. So bring all your gear and plan on a weekend of RDF fun. If you're still a T-hunt wannabe, come out to the start point and see all the neat gear the hunters have put together.

It's unfortunate that only a few ham conventions each year offer RDF contesting as part of the official program. If you're on the planning committee for a hamfest or convention, why not add

Photo B. Kevin Kelly N6QAB built this motorized quad when he put on a long-distance hunt in the Albuquerque area. It automatically turned back and forth to vary the signal reflections from the nearby hills.

Food for thought.

Our new Universal Tone Encoder lends its versatility to all tastes. The menu includes all CTCSS, as well as Burst Tones, Touch Tones, and Test Tones. No counter or test equipment required to set frequency-just dial it in. While traveling, use it on your Amateur transceiver to access tone operated systems, or in your service van to check out your customers' repeaters; also, as a piece of test equipment to modulate your Service Monitor or signal generator. It can even operate off an internal nine volt battery, and is available for one day delivery, backed by our one year warranty.

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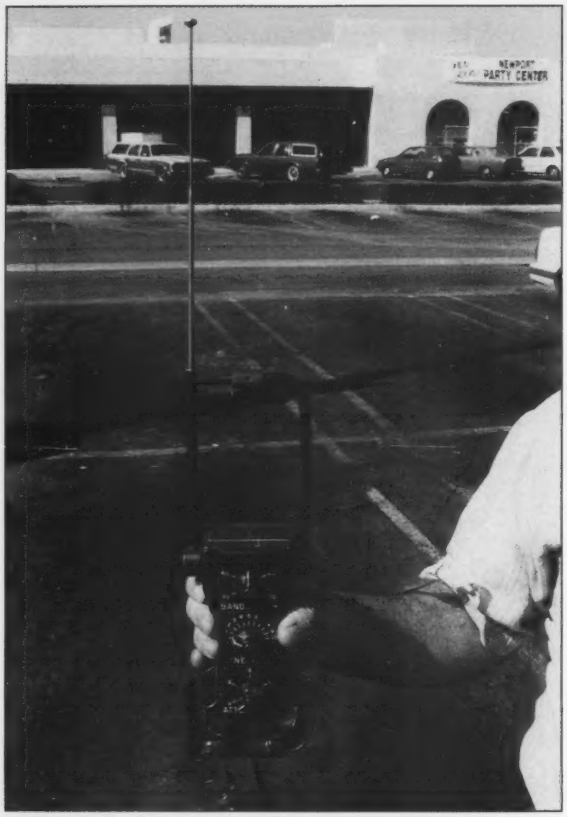

Photo C. The military has used low-band VHF frequencies for many years, so there is a variety of surplus RDF equipment available. This loop-sense unit works fine for T-hunting on 6 meters with no modifications.

a T-hunt as a change of pace? If you do, be sure to let me know at least three months in advance so I can mention it in this column.

A Surprise on Six

It isn't long before every new ham discovers that our band allocations are not exclusive. We dodge foreign broadcasters on 40 meters. On 70 centimeters, we live with oil well locators, shipboard radars, and wind profilers. The 902-928 MHz band is a wasteland because of vehicle locating systems, computer networks, and home video links, with more new gadgets to come.

One band that has remained relatively free of non-ham QRM is 6 meters. For a few days out of the year, there are radio fireworks there, everything from E and F layer openings to tropo, auroral and meteor contacts. The rest of the time, it's a quiet bit of spectrum, perfect for local QSOs and foxhunting.

The Southern California Six Meter Club (SC6MC) has sponsored a monthly T-hunt on 50.3 MHz FM for five years. On the morning of the May 2nd hunt, the hider and hunters were astonished to find their radios alive with military communications. The California National Guard had set up shop on numerous frequencies, including 50.3, as guardsmen patrolled the streets of Los Angeles.

Hider George Stokes WT6U was 20 miles from the nearest guardsmen, but why take any risks? The group quickly decided not to hold the 6 meter hunt.

Fortunately, WT6U had a 2 meter mobile rig with him. There was a quick QSY to 146.565 MHz. None of the hunters had brought mobile RDF equipment along for 2 meters, so everyone used their handhelds with either their 6 meter untuned loops or body shielding. Eventually, all teams found George.

The military has used low-band VHF for communications links for dozens of years. Radios range from 30 to 88 MHz, but communications officers usually take pains to avoid using active TV channels and the 6 meter ham band within U.S. boundaries in peacetime. This was an exception, but there were no complaints forthcoming from the hams.

A benefit of military access to this part of the spectrum is surplus equipment. Besides radio sets, you can find ready-to-hunt RDF equipment, such as the loop shown in Photo C. Several SC6MC members hunt with similar antennas. One source is Fair Radio Sales, 1016 E. Eureka, P.O. Box 1105, Lima OH 45802-1105; (419) 227-6573. 73

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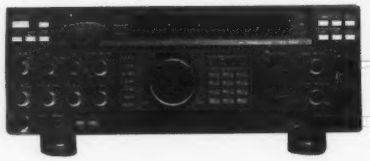

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What's a QRP?

Dayton was a washout this year. Really! The weather was just rotten with rain on and off Friday. The weather Saturday proved to be even wetter, but with temperatures hovering around 40 degrees. Sunday it hailed! There were no happy campers in the Dayton Hamvention flea market this year.

Inside the main building, people were just on top of each other. I could not help but overhear a conversation between two other hams as we were pushed and shoved along in the flow. They were talking about QRP. My head spun around when one guy said, "This QRP sounds interesting. I wonder how much a QRP is and where can I find one." To this his buddy replied, "What's a QRP?"

What's a QRP? How do I get one? How much do they cost?

After all the articles published on QRP operation by myself and others, it seems hard to believe there are people who don't know what QRP is. But what really frosted the cake was my wife asking me what a QRP is.

I tried to explain to her about the International "Q" signals, and that if you send "QRP" with a question mark it means you're asking the other guy to reduce his transmitter power. And that sending "QRP" without the question mark means you have already reduced your transmit power. She replied, "Reduce it from what to what?" Well, she had me there.

There seems to be a very overlooked rule and regulation regarding transmit power of an amateur radio station, Part 97.67, Section B. In a nutshell it says to use the minimum amount of transmitter power necessary to carry out the desired communications. This area becomes a huge trouble spot.

You plop down some money, open up the box and remove your new radio. Plug in an antenna and microphone and you're on the air with about 100 watts of RF. If you're talking to Joe Ham, and you are both running 100 watts, and have a 40 over S-9 signal, you more than likely have just violated part 97.67. No big deal. The feds have better things to do than run around with Bird Thruline™ wattmeters checking on output power. (Although, they did do a survey on operating power awhile back.) As I told her, it becomes very muddy water as to how low you can reduce power to maintain "desired communications." Just what is "desired communications"? Would an S-meter reading of 7 be "desired communications"? How about an S-meter reading of nothing, but you can hear and understand everything Joe Ham is saying? There are too many questions for any one person to be able to say when to reduce power. For the most part, if the transceiver you're running can produce 100 watts, 100 watts is what you'll be running it at. In some transceivers, reducing RF output throws transmitter efficiency in the dumpster.

It's like the guy with the amplifier sitting next to the transceiver. "I only use it when I need it," says Randy as he reads the log book by the glow of a pair of 3-500Zs. Right! The same thinking goes with adding a turbo charger to a V8 engine, "Just in case I need it." Of course you'll use it. That's why you purchased the amplifier to begin with, to use it. No one is going to pay for an amplifier and never use it.

After I explained all of this to her, she still wanted to know what a QRP is. So, I had to put the definition of a QRP into something she could understand. What better way than to let her in on some of the action on 20 meters phone.

I fired up my trusty Argonaut 509 and started tuning around looking for DX. I find DX by listening for the pile-ups. Works every time. I found a huge pile-up right dead in the middle of the advanced band segment. Seemed like a volcano erupted a week or so ago and half a dozen crazed DXers (What's a DXer? Next lesson.) flew in by helicopter to play radio.

The DX station was just working the loudest stations, in no particular order. I called, called some more, and called again. I tuned up higher, tuned down lower, increased the mike gain, lowered the mike gain. I checked the beam heading, moved the beam a bit one way, then the other way. Went outside and checked if the beam was still up on the tower. I checked the antenna connectors, called again, called some more. I checked the SWR_T yes, it was 1:1.3. Whoa, way too high. Out came the antenna tuner, SWR now 1:1. Called some more. A second trip outside to be sure I hadn't cut the feed line with the lawn mower. I called again. I started to scream into the microphone. What's wrong with that guy? Can't you hear me calling you with my 2 watts? Whatsamatteryou! My wife then asked me why I did not turn on the "big radio" like the other people. What, and ruin all my fun? This was a Kodak moment.

After working 47,489 contacts, the DX station went QRT, leaving me out of his log book.

A State of Mind

So what is a QRP? QRP is a state of mind. It's trying to make contact with another station using the least amount of RF power. It's a way of looking at things from a slightly different angle.

For the record, QRP is officially recognized by the QRP ARCI as 5 watts CW RF output power and 10 watts PEP output for SSB work, regardless of the input power. Milliwatting, or the older QRPp term, is power under 1 watt RF output.

Look for QRP operators on the following CW frequencies: 3560, 7040, 14,060, 21,060, and 28,060. Check too on 7030 and 7060 for DX QRP operators. Look for foolhardy QRP SSB operators on 3985, 7285, 14,285 and 28,885.

How much does a QRP cost? Anywhere from the price of a Fireball transmitter all the way up to an Argonaut II and everything in between the two.

QRP: A state of mind in doing more with less power.

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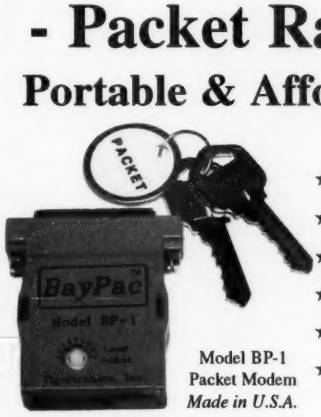

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Using Surplus Parts

This month I will cover a few ideas developed by obtaining items from the surplus electronics market. There are many benefits to using items from surplus but, as in all purchases, you must make the final determination as to just what is a wise purchase. Remember, consumer desire for acquisition must be bridled with a few responsibilities in making a good choice. Don't be tempted to start a new business venture just because you've found a large quantity of left-handed widgets; evaluate the item first. What might seem too good to be true on the surface might be lots of work underneath. Don't count surplus items out, but do use normal good judgement. Sometimes I even ignore my own advice and buy the entire lot, only to discover later that it was not such a hot deal. I stress *buy one* as a disposable education evaluation, and if it is proved out—by yourself or someone you know—then recommend the product. In the same light, don't take on a project too ambitious and expensive—it's a hobby and should be for enjoyment.

I remember a good friend who built an SSB transceiver and purchased all components right from the parts list specifications in the article. The total cost incurred was excessive; he could have saved a very large chunk of cash by using surplus or swap-meet substitutes for specified items. Unfortunately, this project did not have a happy ending. He installed numerous shorted cables without verification and assembled the entire unit without step-by-step testing. There were so many different troubles that it became an insurmountable repair task to make it work, and it ultimately became a source of components for other projects. A very expensive lesson in home construction.

I have made my own mistakes and hope that my description of them will save you from making the same ones.

Never Risk "The Farm"

Projects are supposed to save you money, not become a sink hole into which you pour cash reserves. Don't take on a project that is too ambitious or complex without seeking advice or help from someone who is experienced in large construction projects and can offer assistance. This will save you money in the long run.

The most important step in any project is to make a long-range plan and set goals for aspects of the hobby you would like to explore. Look at several different publications for information on items to construct and use them as a guide to form a shopping list of items needed to reach modest goals. Then take time to fill the shopping list, looking at swap meets. If you slowly gather items by bargain hunting, the cost of a project can be significantly reduced. Build up a junk box of usable components in the general parts category. Standard value resistors, capacitors and such can be removed from junk circuit PC boards at very little cost, and can stock a good junk box. Time is expended here, but at quite a savings. You may say it takes too much time to unsolder components in a salvage operation. Well, let me tell you a little secret—a PC board can be mass unsoldered by several operations.

One method that I do not recommend is the hot peanut oil technique. This operation can be quite unsafe because the oil is heated to solder-melting temperatures and can splatter during the unsoldering operation. Very unsafe. A simple alternative that can be used quite easily and safely is the hot air blower. This blower is the same tool that is sold in most well-stocked hardware stores to blister paint for removal. The blower looks much like a ladies' hair drier, except that it can reach solder-melting temperatures in a few minutes of board heating. I have successfully removed 40-pin chips with this technique and saved the chip intact.

However, I have had difficulties with some plastic parts because they tend to deform in the heating process. I had trouble with plastic coil forms for small IF transformers because they required a little coaxing after the solder was molten. They were a tight fit and this contributed to the coils' demise because of the pressure needed to extract them after the solder was molten.

I usually keep the hot air blower about a inch from the region I am heating. In about two to three minutes the parts will just fall off. When they are loose, just tap the back of the board and the parts will drop in front of the PC board.

Keep the blower on the board to retain heating and move to the next area to be unsoldered. If this region is adjacent to the first it is already preheated and component removal is almost ready in 10 to 20 seconds. I have removed all components from a PC board that measured 15 by 20 inches in about 15 minutes of relatively easy work.

CMOS devices and other chips can be removed with a small variation. Some will drop off, but I prefer to place a small heat sink on top of the chip, using a pair of gas pliers. When the chip is ready to be pulled off, don't rush the operation; wait a few seconds after the point where the solder will permit the chip's removal. These extra seconds will allow removal of excess solder on the top of the board that might cling to the top of the chip's pin after premature pin removal. If you wait just a little, the pins look factory-fresh when the part is removed. Parts so removed can be sorted, and you will be amazed how fast your parts junk box will build up, saving on the cost of future projects.

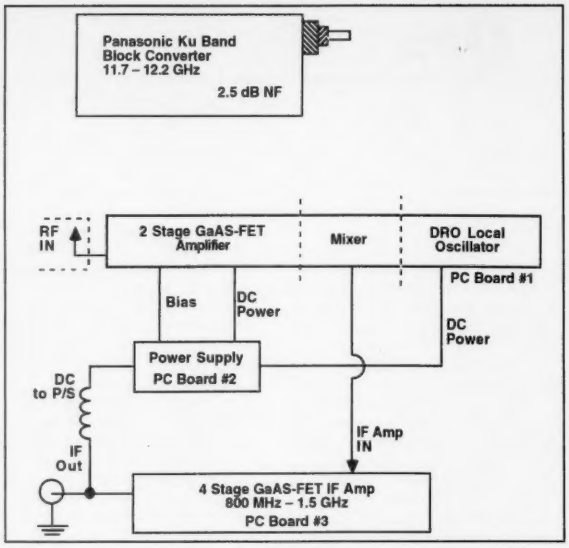

Figure 1. Ku band converter.

Eventually some key items have to be purchased for any construction project, but try to find these parts in a careful search. Sometimes a friend might have that part and that's a swap in the making. I constructed a receiver for HF when I was given my first Collins Mechanical Filter (a long time ago). Today my interests are in the microwave spectrum and as such I constantly look at the surplus market for items that can be re-used to advantage on our higher frequency bands. Anything of value from 30 MHz up can find a new home and be put to good use.

An example of a surplus item that is starting to filter down to dealers is the 12 GHz (Ku Band) satellite downconverter. The reason they are available in surplus is their higher noise figure, something running from 2 to 3 dB being typical. The nominal cost for a used converter head is under $15. You might say, what can I do with one? Well, disassembly of a unit will give you three printed circuit PC boards loaded with components. One board (under a cast-metal cover) contains a 12 GHz RF amplifier (two-stage GaAs-FET), a single diode mixer at microwave, and a Dielectric Resonant Oscillator (DRO). The second PC board is the power supply for the amplifiers, and the third PC board is the output IF amplifier. Usually this amplifier is a four-stage unit capable of 30 dB of gain from 800 to 2000 MHz. The noise figure of this amplifier must be quite good to retain the downconverter's total noise figure and function (I believe it to be in the 1.5 to 2 dB range).

Now if you separate the IF amplifier you have an excellent RF preamp with high gain for varied applications as it sits.

All you have to do is add coax connectors and connect a power supply (12 volts DC) to finish it. The IF amplifier normally covers the 900 to 1500 MHz range and will function slightly lower and quite a bit higher in frequency from its design frequency. This can make a good low-noise weather satellite RF amplifier, 1691 MHz or even a 1296 MHz RF amp. Kerry N6IZW and I are even thinking about using these for a first IF for SSB operation to remove our mix products for microwave operation. Considering the cost of about $5, and the three PC boards in the original unit, this is quite a bargain.

Even the junk enclosure that previously was discarded can be recycled as scrap aluminum. The remaining RF amplifier (12 GHz) can be cut away from the DRO oscillator and by attaching coax connectors and some shim brass to form a box enclosure for the amplifier you can render this unit usable. Further modifications are possible if you remove the matching stubs on the amplifier's stripline and retest the unit with the drive on 10 GHz. It is possible to retune the amplifier down to the 10 GHz amateur band with good results.

Retuning is done by watching gain and applying snowflakes (very small copper scraps Super-Glued to a toothpick). Moving the toothpick tuning tool will indicate where to attach snowflake bits of tuning copper. Solder them down to the stripline, watching for gain increases.

They will work just laying on the line during test procedures. Other copper bits are added to peak the amplifier as adjustment progresses.

As you near final adjustment, some of the first copper snowflakes might

Photo A. An example of Ku band (12 GHz) block converters, which contain many usable PC boards.

have to be re-adjusted slightly to remove interaction. When you are satisfied with what gain you have obtained, start soldering the snowflakes in place one at a time.

This process can be tedious but is no more complex than building an amplifier from scratch. The time required is about the same to construct a new unit or modify an existing unit. The main benefit from surplus parts is the low cost.

Remember that you are dealing with static-sensitive devices and as such use a static-free work station along with a temperature-controlled low voltage soldering iron. Wrist-static grounding straps tied to a work bench grounding assembly/modification station will help prevent device damage. Make sure all the grounding is good and that your soldering iron is in the common grounding loop with your work piece. I use a large scrap copper plate for my common work surface for modification or assembly. The soldering iron and all work tools are tied in common to this copper plate. I am tied into the plate with a low current conductive high resistance safety wrist strap. Direct connection is not necessary. I touch the plate before any pick-up or other parts (GaAsFET) placement to remove possible static charges. They (static, 5 to 6 volts) can destroy your FET. If you have any difficulties working with FETs, start out with low-cost ones or surplus devices until you feel comfortable working with them.

The point to make here is that cost can be reduced with a reasonable amount of involvement on your part. Don't be disappointed if some of your first projects don't turn out well. In the beginning we all fail at first, but with a little persistence and application most projects change from a doorstop into something usable. If you get into difficulty, drop me a line and I will try to help you out and get your project working. In one respect I went off the deep end long ago in that I have set up a good test and calibration bench able to work on most anything, more test equipment than operating amateur equipment.

Mail Box

Ed Barbacow K3ZCY from Carmichaels, Pennsylvania, writes that he has just obtained a 3/4 -40 tap. Big deal, you say? You bet it is! That is the "custom special" needed if anyone wants to use a 416 variety microwave tube. This tube is capable of several watts of power on bands up to 5 GHz, making it quite good news. Ed is offering to help others out with nuts tapped for this 3/4 -40 thread to use with the tube in an amplifier. This was a big stumbling block in previous years. Drop Ed a line at 330 Ceylon Rd., Carmichaels PA 15320-1354. Also, Ed is looking for a waveguide for 5.6 GHz. He needs a straight section of Wr-137 (about 7 to 10 inches long, with flanges). He is experimenting with a waveguide filter for 5.6 GHz.

Al Berry NZ5W of Panama City Beach, Florida, inquires if the CW IDer is still available, and if so, is the cost still $12.50? Yes it is available, and the cost is the same. That is, as long as I still *have* surplus EPROMS available to program. That is what helps to hold down kit cost. Other kits that I offered have not fared so well, such as the 30 MHz transceiver for 10 GHz Solfans (Solfan special). The IF chip (a TDA-7000 from Signetics) is becoming hard to get, and currently I am out of stock. I will try to rectify this kit or redesign it with another chip type.

Larry Chrisman K9OXX reports that he now wishes he'd bought a life subscription to *73*, since *HR* folded. He states that *CQ* has gone downhill ever since they dropped the surplus conversion/VHF RTTY and other experimental stuff from the magazine. Larry said that's why he canceled his subscription. One question he asked concerns the Stereo Solfans alarm units for 10 GHz. He wonders about their specific applications. Can they be used with a standard 30 MHz IF strip? The answer to your question is yes, they can, but you do not need both detectors for WBFM operation.

The alarm application needed the dual detectors which operated in stereo to give additional information to the alarm sensors. The benefits of dual detectors versus single detectors is that dual units can detect movement and determine if the object is approaching the detector or moving away from the unit. The alarm unit can be set to report on movement towards the unit only and ignore movement away from the unit. This is one modification to reduce unnecessary alarms. Newer units use both stereo detection and an optical scan (IR). The unit can be set up to require both optical and microwave return to verify actual movement. This prevents false alarms.

Larry states that he spent lots of time in San Diego and remembers the many different surplus electronics dealers in SD from his service days in the '60. He spent many hours browsing and picking up goodies then. Now his home town doesn't have much more than Radio Shack and hamfest flea markets—not much for the experimenter. Well, that's just the reason why I try to put together modest-priced items that I run into from time to time—to help out on some of the projects that I describe in the column. I call these items the key parts; in the microwave spectrum I have come to call them "UNOBTAINIUM" due to the difficulty in procuring them at reasonable cost. There are many different mail order houses and selections to make even in San Diego. I usually find a new one sprouting up every so often, that helps to keep up on bargains.

As long as they're small, my wife will let me keep my newest acquisitions. Because newer hams coming online are anxious to get started, they seem to have a hard time finding bargains without getting sold a bill of goods. There are lots of dealers out there, but some don't advertise all the time.

Next month I will cover a surplus power amplifier for 10 GHz that was available from Halted Specialties. As always, I will try to answer your questions on microwave and related activities. Please send an SASE for a prompt reply. 73, Chuck WB6IGP. 73

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The ASR-33

With all the high-tech talk these days, we often lose sight of the fact that, for many hams, fancy computers and the like remain an unattainable goal for a variety of reasons. This hobby of ours continues to encompass a wide range of preferences and directions. Several letters this month illustrate the case well.

Eugene "Mac" McAleer N9DUW of Addison, Illinois, responded to my comment alluding to the old ASR-33 sitting in my basement that I have trouble parting with. He relates being "in the same predicament here. My '33' was donated by a fellow ham who saved it from the junk yard for me. It is like the day it was built. Actually, I would like to use it but need some information for a converter for 60 and 100 wpm Baudot to 100 baud ASCII for the machine. The only input seems to be a phone line. Powered up, it types just fine.

"So hopefully you can supply me with some information or tell me where I can obtain some. I am an avid RTTY art fan and have a collection of some 1400 pix. I presently run a Model 28 for pix hard copy along with the glass TTY IBM compatible. Our ham club runs a VHF RTTY repeater with a great deal of activity on it, including a pix net one night a week."

Well, first off, Baudot to ASCII conversion was a hot topic in the early-to mid-1970s, before the personal computer revolution took off. Several such schemes were published here in the pages of *73* during those days, and a search of back issues turns up many solutions. I have sent a list of some such solutions to Mac. If there is enough interest among the readership, I would be happy to review some of the techniques here. Alternatively, just hooking the ASR-33 to the serial port on the computer, with some suitable programming, might be enough to make the thing run, without having to re-invent the wheel. I am sure someone out there is still doing this, and will share his or her technique with us.

The other topic you mentioned, Mac, RTTY art, was one near and dear to my heart many years ago. I even went so far as to translate one or two pictures onto an automated Selectric typewriter I used at one summer job, with pauses built into, shall we say, critical areas. At one time, samples of RTTY art were featured here in "RTTY Loop," including the annual contest. Having heard nothing from that quarter in many years, I assumed that such activities were passé. If you or others with interesting or unusual works of RTTY art would like to forward them here, I would be happy to consider them for inclusion in an upcoming column.

DesqView

Accelerating at Warp 8 from the vintage to the vanguard, I received a letter from Rick Arzadon WA8RXI of Taylor, Michigan, who is looking to run what may be the supreme RTTY computer station. He says he is "seriously contemplating acquiring DesqView to run three or maybe four programs concurrently. What I essentially want to do is be able to switch between logging, a QSL manager/database, 2 meter packet, and HF digital modes, without losing a beat monitoring packet at the same time as holding a digital QSO (RTTY, ASCII, AMTOR, etc.) on the HF rig. I believe with the equipment I have I can accomplish this using DesqView.

"The equipment here includes a Kenwood TS-830S, Kenwood TR-7400A, AEA PK-232MBX, and a 386SX computer running MSDOS 5.0, without Windows.

"Now, I guess my major question is, has anyone successfully modified a PK-232 either by hardware or software to make it act as a dual-port modem? Or, would it be better for me to add the PCB-88 or a similar board for VHF packet only to my system? Or, do you know of a system that will allow me to multitask amateur radio programs without going to a program like DesqView?"

Whew! That is a tall order, Rick. First off, I don't believe there is any way to make the PK-232 a dual-port machine. There is too much shared circuitry, when I look at the book, to be able to accomplish this with massive modification. The Kantronics series of interfaces do incorporate dual-port design, to my knowledge, and they may well have served you better in this quest. Alternatively, you may be able to add another terminal unit, such as a dedicated board in the computer, to add the second channel capability.

As to the multitasking, you have several choices. A limiting factor may be, however, the computer you are running. You will need sufficient memory to allow all these programs to run unrestricted, and using several COM ports at once, such as may be required if monitoring packet and sending on HF RTTY, might cause some interrupt conflicts. DesqView may well be able to accomplish the task. From what I have read of this program, it seems to be able to robustly mix a variety of programs in a multitasking environment. Windows 3.1 is a lot healthier than its predecessor, and with adequate memory, running in 386 enhanced mode, it may do as well also. Then there's OS/2. Just starting to appear on dealers' shelves, reviews of OS/2 indicate that this might be just what you're looking for. You will need plenty of memory and hard disk space, though.

Somehow, I think that among our readership there is someone who has already braved these waters, and I look forward to receiving reports of these accomplished explorations. If received, I will pass them along in future columns for the benefit of all.

Howard Halperin N7ETP of Phoenix, Arizona, is looking to hook up his Kenwood TS-430S transceiver, with a PS-430 power supply, SP-430 speaker, and AT-250 antenna tuner on RTTY. His question, "How?" The answer, "simple!"

As we have elaborated over the past few months, all you need is an interface and terminal. This can vary from one of the older interfaces, such as the ST-6 popular many years back, to one of the new multimode controllers. Ask around the Phoenix area; I am sure that there will be those to hold your hand while you hook up the equipment. Who knows, maybe a reader of this column in your area will contact you, first!

A few months ago, you all pointed out the new source for old Microlog products. Now, here's a note from A. H. "Monty" Munro NØDSH, who is ISO (that's In Search Of, for those of you who don't read personal ads) another old unit. He says that he is "interested in RTTY/AMTOR but not packet, and the interface I can put on my C-64 to use AMTOR. I have no info about who manufactures the CP-1 and MBA-TOR or a unit like it." I remember ads for these units, but cannot put my finger on them at the moment. Reader input regarding both availability and usability of these C-64 RTTY devices is solicited.

Several of you have asked about the availability of the Color Computer programs offered in "RTTY Loop" several years ago. I am sorry to report that my Color Computer has bitten the dust, and I am no longer able to provide programs for that system. The programs described are available both on CompuServe and Delphi, in the amateur radio and color computer special interest groups. If you do not have access to either service, but have a friend who does, the programs can be downloaded to *any* computer, then you call your friend's computer with your CoCo and download from there. You don't have to have a Color Computer to pick up the programs, only to run them! After all, neither CompuServe nor Delphi use Color Computers as mainframes. If you still don't understand, drop me a note, with a self-addressed, stamped envelope, or buzz me on one of the online services mentioned at the end of the column, and I'll explain it again, step by step.

More goodies next month, with more of your letters, and other items of interest to the digital ham. Meanwhile, communication is invited by letter, or via CompuServe (ppn 75036,2501), Delphi (username MARCWA3AJR), or America Online (screen name MarcWA3AJR). 73

Number 25 on your Feedback card

UPDATES

VE3CYC'S WIRE BEAM

See the above article in the June '92 issue of *73*, page 18. In the bandswitch diagram (Figure 9), the switching parts (armatures) are drawn the wrong way. They should be connected to the row of center connections instead (see the corrected Figure).

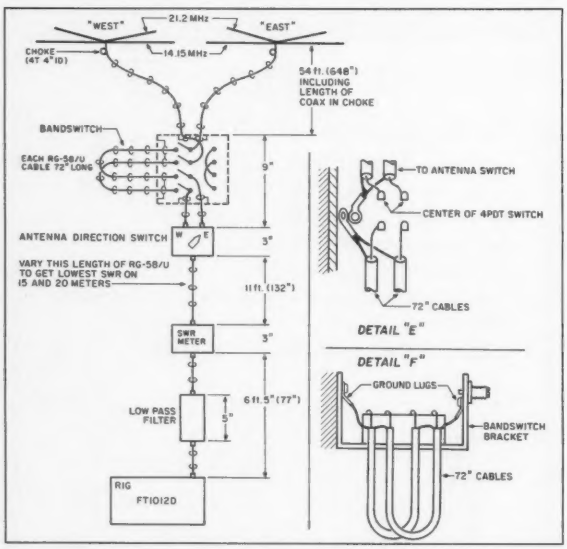

Figure. The corrected bandswitch diagram showing the proper switch connections.

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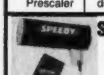

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PB-1 kit $14.95

NEW

SPEAKER PHONE

Talk on the phone hands-free, great to put in shop or shack, press the button to answer—no actual phone needed. Works same as commercial units. Talk from anywhere in room, phone line powered—no battery needed. Super for family and conference calls or buy two for hands-free intercom! Add our case set for a pro look.
SP-1 ..... $29.95 Case-CSP $12.95

TICKLE STIK

A shocking kit! Blinking LED attracts victims to pick up innocent-looking can—you watch the fun! Ideal for office desks, parties, nosy know-it-alls!
TS-4 kit $9.95

LIGHT BEAM COMMUNICATORS

Transmits audio over infrared beam up to 30'—use simple lenses to go up to ¼ mile! Hum free, uses 30 kHz carrier. Great for wireless earphones or undetectable "bug." Transmitter + receiver set, LB56 . . $19.95

FM RADIO

Full-fledged superhet, microvolt sensitivity, IC detector and 10.7 MHz IF. Tunes Std. FM broadcast band as well as large portions on each end. Ideal for "bug" receiver, hobby experiments or even as FM radio!
FR-1 kit $19.95

SUPER SLEUTH

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Very popular sensitive all-purpose preamp, ideal for scanner, TVs, VHF/UHF rigs, counters. Lo noise, 20 dB gain, 100 kHz–1 GHz, 9V–12 VDC operation.
SA-7 kit $14.95

•2 METERS •223 MHz •440 MHz

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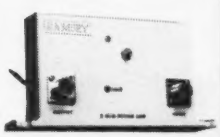

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(Specify band: QRP-20, 30, 40 or 80)
Matching case & knob set, CQRP $12.95

20, 30, 40, 80M All Mode RECEIVERS

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Your choice of bands $29.95
(Specify band: HR-20, HR-30, HR-40, HR-80)
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CW-7 kit $24.95
Matching case knob set, CCW $12.95

2, 6, 10 MTR, 220 FM RECEIVERS

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Matching case & knob set, CSS $12.95

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FM-10 kit $29.95
Matching case set, CFM $12.95

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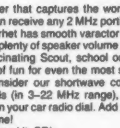

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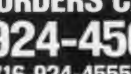
Shortwave converter kit, SCI $27.95
Matching case set for SRI, CSR $12.95
Matching case set for SCI,CSC $12.95

AIRCRAFT RCVR



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Matching case set, CAR $12.95

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Welcome to "Packet & Computers," *73*'s new monthly packet radio column. Each month I'll take a look at the hardware, software, and networks of amateur packet radio. This column is designed for two sets of readers: the end user of the network, and the sysop. It is my intention to provide useful information to both, but in order to accomplish this I need to know what you want to see here. Let me know what you like and don't like, and more importantly, how I can make things better. The packet radio community is diverse, and this column will reflect that.

More Than Mail

Most packet users never get beyond reading and sending mail and bulletins, but there's more out there on the network. Information, stored on database servers, can be accessed from your local PBBS, and access to the Internet—a huge network of institutional, government, and industry computers—is also available.

The White Pages

Don't know the home PBBS of a ham you want to send mail to? Most PBBSs will let you look it up in the White Pages. There are two ways to use this service. First, if the ham you want to know about is known by the PBBS, you can ask directly (on a WØRLI PBBS, others may vary): "I (call)," where (call) is the callsign of the ham whose address is in question. On the other hand, if you are asking, the ham is probably not local so asking the PBBS won't do much good.

Still, there is a way to find out. You can use the White Pages (WP) server located at AD8I. This is a national registry of home PBBSs that probably has the information you need. To get the information, you simply send a specially formatted mail message to WP@AD8I. The commands on a WØRLI PBBS are like this (a carriage return follows each command):

SP WP@AD8I:
(SP is for Send Private.)

QUERY This is the subject line of the message.

(call) This is the call of the ham who you are interested in. It is the first line of message text.

(CONTROL+Z) This ends the message.

The query will be answered within a couple of days by return mail.

Electronic Callbook—REQQTH@WA4ONG

Buckmaster Publishing sells a CD-ROM version of the U.S. *Callbook*, and Jim WA4ONG has seen to it that it is available to any amateur with a packet station. The REQQTH server is accessed with a specially formatted mail message. The commands on a WØRLI PBBS are (a carriage return follows each command):

SP REQQTH@WA4ONG SP is for Send Private.

(call), (call), (call), (call),
(call)@YourHomeMailBox

This is the contents of the SUBJECT: line. (call) is a call that is being queried, the list of calls can be separated by commas or blanks. YourHomeMailBox is the address to send the answer to.

(e.g.:N1EWO@WJ9U.IN.USA).

/EX This is the first line of the message text, and the only thing that should appear in the message.

(CONTROL+Z) This ends the message.

The answer to your query will be sent via return mail within a couple of days. It will include the callsign, name, address, and date of birth.

The WB7TPY Packet/Internet Gateway

The Internet is an enormous network of computers owned by corporations, universities and government institutions. The connection allows them to share files and mail, and is designed to facilitate industrial cooperation. There are millions of people with Internet mail addresses, and thanks to the WB7TPY gateway, it is possible to send them mail from packet. The gateway is located at WB7TPY.AZ, and routing mail through it is simple. On a WØRLI board the commands look like this (each one is followed by a carriage return):

SP GATE@WB7TPY.AZ.USA.NA
SP is for Send Private.

(subject) Fill in your subject when prompted.

Internet: (a valid Internet address) This is the first line of text. It should be a valid Internet address in the standard format.

(CONTROL+Z) This ends the message.

These are just a few examples of the services available on the packet network. PBBS help files often include descriptions of other services that are available. We will look at others here from time to time, including a frequency database and a project to compile an up-to-date repeater list using packet radio and the Internet.

Life After WØRLI

WØRLI's excellent software is seen on the overwhelming majority of PBBSs (Packet Bulletin Board Systems) in the U.S.. There is a reason for this: It is relatively simple, well-written, and it works! Though some sysops I have spoken with are ready to move on to newer and better things, they often express fear about new software. There is an impression—probably not too far from the truth—that the packet forwarding system is a tenuous and delicate thing. Sysops whose PBBSs serve hundreds or thousands of local users are understandably conservative. Most of the experimental souls are concentrating on the network infrastructure. This is a little safer; either the link exists or it doesn't. PBBSs generally have many possible paths to forward their traffic so no one gets hurt.

On the other hand, a rogue BBS can easily disrupt traffic in an entire region. It makes for some sleepless nights for the poor sysops who worry about such things. There is a problem, though. This conservatism means the end users are stuck with an antiquated, difficult-to-use interface to the packet networks. The ironic part of this is we are stuck with WØRLI because it works so well. It does what it is supposed to, when it is supposed to—as the end user community stagnates. All this is very easy for me to say—I don't have to develop the new software and make it work. But there are other PBBS programs out there right now trying to make a dent in the WØRLI world, and they need some help.

One of the problems with these other systems is that they are still concentrating on the sysop. They provide enhancements for the convenience of the sysop and the forwarding network. You've got the gun pointed the wrong way, guys! We need enhancements to the user interface. There is no question in my mind that the WØRLI forwarding code could be improved, but as I pointed out earlier—it works. If we start seeing some innovation in the user interface, everyone will win. Sysops will sleep peacefully at night knowing that the traffic from their PBBS is moving around the world—slowly perhaps, but smoothly. And the end user—after all, isn't that what this is all about?—will find new fun in packet radio, and not stick to only three or four commands that they have figured out.

Where to Begin?

I have done a lot of talking about improving things, so I will take the first step and make a suggestion about where to start. This stuff is addressed to all you whiz-bang programmers out there who are just dying to implement something new, and to the sysop and end user "customers." You, after all, are the people who will make this thing work—or not.

Client-Server

The Client-Server paradigm (a paradigm is a way of thinking about a solution) takes the greatest advantage of the distributed computing power that is available on the packet network. Has it ever struck you as silly that you take your computer—anything from a C64 to a shiny new 80486—and turn it into a dumb terminal, just so you can talk to another computer? This is a waste of computing power, and is a model from the dark ages of computing. Instead, you should be able to take full advantage of your local computing power to handle all sorts of operations. Note: Before anyone blows a gasket, we do need to keep the terminal interface for those people who are actually using dumb terminals.

If the interface between the client (the end user) and the server (the PBBS) were designed with the idea that the client had some intelligence, it would open up all sorts of possibilities.

Traffic Reduction

A standard data compression scheme could be employed to greatly reduce the number of packets required to send and receive data. This would certainly help reduce the loading on the user port frequencies which, in some places, are overcrowded. If messages were stored in the compressed format, it would also free up precious hard disk at the BBS end.

Batch Mode Interaction

Right now, a PBBS must deal with every packet that comes from a connected station. If the front end were intelligent, a forms-based, fill-in-the-blanks approach would allow the end user to compose all messages off-line, and then send them to the PBBS in a batch. This reduces the time that the PBBS itself is busy. it would also mean that a single PBBS could deal simultaneously with as many connects as the TNC allows, since these connects are not interactive, and disappear as soon as the traffic is passed.

The Power of Forms

Using the forms-based paradigm, users could access all of the services available via the packet network without reading any of the often confusing instructions that are written to explain how. For example, a query to a *Callbook* server would only require filling in the fields in a form—callsign is really all that would be needed. Message formatting would be handled by the client software. A really powerful application for this sort of approach is in emergency communications.

Here in the Midwest, the majority of emergency operations revolve around severe weather. With the appropriate form, a weather-spotter could fill in the observation, which would be forced into the standard format, and then choose send. This would connect to the local RACES PBBS for exactly as

long as was needed to transmit the information—which would only need to be a few bytes, representing the value of the various fields—and then disconnect immediately, freeing the PBBS and frequency for other stations.

Standards

In order for this idea to work, we need to have a standard, efficient machine-to-machine interface. In the amateur radio community, much as in the real world, standards often come from one really good product that gets copied. So, here's your chance to get famous—if not rich. The server end needs to be WØRLI compatible on the back end to facilitate its introduction onto the network. Enhancements to forwarding or whatever can come later. It needs to support a simple, terminal-style interaction for dumb terminals that are out there. It should incorporate data compression, and some sort of solid event tracking so the machines don't get out of sync and confused. And finally, don't design it for today—design it for tomorrow. Remember when 640K looked like the universe?

The other standard we need is one for forms. These forms should be defined by simple ASCII text files. This way, they are easily transmitted across the network by service providers starting new services. The definition syntax needs to support fields, and data types for those fields. Fields must also be definable as required or optional. The first release of the client software must include forms for packet message traffic, NTS traffic, packet White Pages, and the Callbook server. Other forms can follow.

Both halves of this project should be written in ANSI C, with portability in mind. The user interface on the client side should be CUA (Common User Access Compliant) to smooth the learning process. There should be mouse support, and hooks should be included for speech synthesizers for visually impaired hams.

I'm Available

I won't offer this challenge without putting myself on the line. If anyone decides to tackle this problem, I'm available to help with design—I don't do code. This system is sorely needed by the amateur packet community, and besides, it could be a lot of fun. I can be reached care of *73* and on BIX or MCI Mail as jsloman. 73

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P.O. Box 131646
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Dayton '92 Youth Forum

After months of interviews, phone calls, letters, and faxes, the big day finally arrived on April 25, 1992, at the Youth Forum of the Dayton Hamvention. Few people can really appreciate the amount of hard work, preparation, and anxiety that goes into getting ready for a forum at a national convention. The Youth Forum in particular involves lots of coordination with the youngsters and their parents as well. Fortunately, the folks who run things for the Hamvention are very professional and they help to make sure everything falls into place when it's supposed to.

My concerns ahead of time were twofold. One: I was searching for months for young people who were articulate and enthusiastic about amateur radio. Two: I was hoping that many hams would be bringing non-ham children to the forum as we had been publicizing it in the radio magazines. It's very clear to me that youngsters respond eagerly to their peers who speak about having fun in their hobby.

Happily, all anxieties were for naught. Once we got started, all of the young speakers impressed the "standing room only" audience with their eloquence, composure and their dedication to amateur radio. Even though we were really pressed for time, I was pleased to be able to introduce some special children in the audience. John Kosakowski KC3TM is the proud dad of two young hams. He brought them along to see the Youth Forum at my invitation after having spoken with them on the CQ All Schools Net a few months ago. Robert KA3WTG is 8 years old and in the 3rd grade at Heights Elementary School in Natrona Heights, Pennsylvania. He's worked 274 countries on CW and SSB. He has already passed his 20 wpm code test and is working on his Extra. His brother Tony KA3WYS is 7 years old. He has worked 171 countries and has made over 600 stateside contacts. He has passed his 13 wpm and is working on his Advanced. Can you just picture the smiling faces in the audience? It was wonderful!

First up to the microphone was Todd Martinson KB9HGE. He is 15 years old and is a freshman at Elston High School in Michigan City, Indiana. His interests are in emergency communications and in DXing. Todd was on CB for a while, and then became friendly with a ham police officer who provided him with license exam information. Now he is a Tech Plus and encourages young people to join the fun in amateur radio and become part of the "family." Todd plans to be a police officer when he grows up and feels that the radio hobby will be a tremendous asset to him in his chosen career.

Our next speaker was Lynn Hummel N3IZE, 12 years old, with a General license. He's in the 6th grade at the Clearfield Area Middle School in Clearfield, Pennsylvania. Lynn emphasized the fact that he got into amateur radio as a family project. He and his parents responded to an ad on local TV for a licensing class. They upgraded and got involved in recruiting school children, always as a family project. He told the children in the audience to consider getting their licenses so that there can be lots of activities on the radio that mostly children could be in together.

Angie Fischer KBØHXY is 13 years old and has a General license. She is president of the Gateway to Ham Radio Club at the Sacred Heart School in Valley Park, Missouri. I've spoken with Angie on the air, and her enthusiasm for the hobby is obvious to the children who speak with her from my class. Angie is very actively involved in recruiting other youngsters, believing that kids do the best job of "selling" ham radio to other kids. With the help of her mentor, Dave Novak NØDN, she produced a "rap" song extolling the virtues of Morse code. Angie has been selected as the recipient of the 1992 Westlink Young Ham of the Year award. Yaesu USA Corporation presented Angie with an expense-paid trip to the Hamvention where she received a plaque from *Westlink Report* and a major equipment gift from Chip Margelli of Yaesu at the end of the Youth Forum.

Daniel Savio AA2GM is 11 years old, is in the 5th grade and has an Extra class license. He's from Ridgewood, New Jersey, where he first became interested in Morse code at the age of 4. He's always been interested in electronics, and used to watch his dad work with his oscilloscope and computers. Daniel has been building many different electronics projects since he was a little boy. He amazed the audience by explaining his interest in high technology. He loves digital communications, like packet radio, AMTOR and RTTY. Daniel is trying to get the DXCC in CW. He also enjoys working other stations by satellites. He explained to the youngsters in the audience that ham radio has helped him with his studies in school, such as geography, science, math, and foreign languages.

Next up to bowl the audience over with her wonderful presentation was Christina Witkowski KC6YUT, 13 years old, from Glen Ellen, California. She attends the Altimira Middle School where she is a 7th grader.

Photo A. Left to right: Angie Fischer KBØHXY, Travis Wise KB8FOU, Christina Witkowski KC6YUT, Carole Perry WB2MGP, Todd Martinson KB9HGE, Lynn Hummel N3IZE, and Daniel Savio AA2GM.

Christina has a Tech Plus license and is a joy to speak with on the radio. The children in my ham radio classes look forward to speaking with her on the CQ All Schools net where she often checks in from Mr. Burnell's classroom where she is a teaching assistant. Mark Burnell KB6ZOL is an old friend of the school net. Our classes have spoken with each other on the net, and have followed up with pen pal letters and school video exchanges through the years. There have been occasions where I had to step away from the radio for a few moments during the net, and I had no qualms about leaving Christina as net control until I returned. Her dad, Mike KC6YUV, is also a regular check-in to the net with his students from the Dunbar School.

Last, but definitely not least, was Travis Wise KB8FOU from San Jose, California. He is 16 years old, has a General license and attends Del Mar High School. This mature young man happens to write a column called "The Youth Forum" in *World Radio*. He told of how he helped out with emergency communications following the 1989 Loma Prieta earthquake. He explained how learning to communicate under pressure has helped him in school and in the rest of his life as well. Travis's family utilizes the radio to keep in touch with each other. He encouraged people in the audience to think of ways that they can expose youngsters to the benefits of ham radio. He suggested doing demos at schools, Scouting meetings, and places where young people congregate. Travis stressed how ham radio can open doors to employment, excitement and adventure.

The Youth Forum at Dayton is a place to showcase young people who are enthusiastic about what the hobby and service has to offer. All the youngsters I've been fortunate enough to be involved with at the forum are deserving of all our praise for they are truly the future of amateur radio. 73

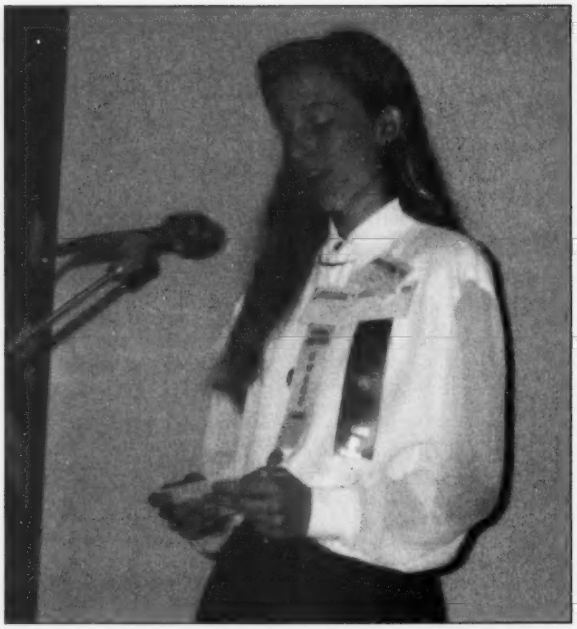

Photo B. Angie Fischer KBØHXY, Westlink Young Ham of the Year.

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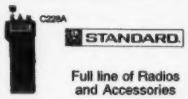

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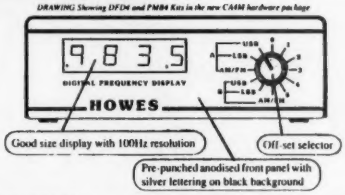
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Satellite Portable

The warm months of summer and early fall are great for antenna projects and outside activities. Whether it's Field Day, a Scout campout in the woods or just a trip to a nearby lake, the time is right for experimenting with amateur radio satellite activity.

Most satellite enthusiasts have a set of permanent antennas at home connected by carefully routed low-loss coaxial cable to radios and amplifiers that rarely move out of the closet, study or bedroom. When the always-on computer predicts a satellite pass, they activate the rotators to track across the sky and then make contacts. Why not try it from the wilds?

While checking the white bass population of a beautiful Texas lake, I made time for some serious satellite chasing. Rather than drag along a complete array of circularly-polarized yagis, I chose simple antennas for the outing. I managed to stuff a small car with a short horizontally-polarized yagi for 70cm, a Ringo Ranger for 2 meters, a base-loaded, magnet-mount whip for 15 meters and a dipole for 10 meters along with some spare and borrowed radios, food, fishing gear and other necessities.

Before leaving, I checked orbital predictions for every satellite that used the bands covered by the available equipment and brought along paper printouts of convenient passes.

The results were mixed. The fishing was great and contacts via some satellites were excellent, but the high orbiters, AMSAT-OSCAR-10 and AMSAT-OSCAR-13, yielded no QSOs.

For RS-12 with its mode K transponder (15 meters up and 10 meters down) results were consistently satisfying. On the uplink, an NCG 15m monoband transceiver provided 15 watts output for CW and SSB. The power was passed through 50 feet of RG-8X coax to the modified mobile magnet-mount antenna (originally on 11 meters, now tuned for 15) perched on the roof of a nearby van. A Uniden HR-2510 was set to receive the 10 meter downlink using a dipole strung from the eaves of the house. No preamp was needed. Although the selectivity of the HR-2510 is lacking, the sensitivity was very good. Several contacts were made with this setup.

The mode A transponder (2 meters up and 10 meters down) on RS-10 was equally easy to work. An ICOM IC-211 worked fine with the 2 meter Cushcraft Ringo Ranger. A small power amplifier was available but rarely used. The 10-watt output from the ICOM was sufficient for good coverage of each available pass. Some dropouts were noted at very high elevations when the satellite passed overhead, but didn't present a significant problem until later.

RS-14 was operational with linear-transponder activity. Signals from the mode B (70cm up and 2 meters down) system were quite good using the Ringo Ranger and a preamp. I attempted contacts but the short 70cm yagi became a problem. Making contacts and running outside every few minutes to aim it was inconvenient and sometimes impossible. If the antenna had been placed closer to the radios or the radios moved outside, the situation would have improved. Check the April 1991 "Hamsats" column for complete frequency charts for RS-12, 13 and 14.

After having made a contact via A-O-13, using only ground-plane antennas, on 70cm and 2 meters while on vacation last year in Colorado, I assumed the Ringo on 2 meters and the yagi for 70cm would be sufficient. They were not. The Ringo Ranger had been mounted above a TV antenna, thus out of easy reach. During the fishing weekend, the satellite was at extremely high elevations, above 60 degrees. The pattern of the vertical antenna favored the horizon and signals from the satellite's mode "B" transponder were uncopyable. If the antenna had been easier to get to, it could have been oriented perpendicular to the computed beam heading for much better reception.

A similar situation existed for mode "J" (2 meters up and 70cm down). Although the 70cm downlink could be heard well with the small yagi and a preamp, no amount of effort with the 2 meter uplink, now running 40 watts, yielded a contact. Although the signal was detectable through the transponder, it was not enough to complete a satisfactory QSO.

Unlike HF operation, where band conditions can send a milliwatt signal around the world, space communications adhere to link-performance equations dealing with effective-radiated power and path-loss figures. The situation never gets better, it only gets worse. The orientation of the satellite's antennas, transponder loading, atmospheric noise and local interference all combine to make the path more difficult.

For any satellite-chasing activity, whether at home, in the car or on the lake, antennas to match the satellite and situation are just as important as the radios, preamps and power amplifiers. Simple antennas work with the low-earth-orbit satellites when the path is short and the signals strong, but they rarely provide consistent results via A-O-10 and 13. Some gain and directivity is needed.

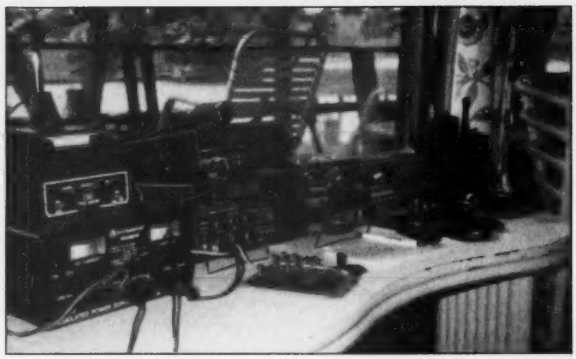

Photo A. A well-stocked portable satellite station for Modes A, B, J and K.

A Portable Answer

AMSAT Area Coordinator Allan Fox N5LKJ has always been interested in making more satellite contacts with less equipment. His article "Poor Boy Satellite Station" in the December 1989 issue of *73* described his efforts with RS-10 mode A using a coat-hanger ground plane on the uplink and some surplus house wiring to fashion a dipole for the downlink. The system worked well and has been an inspiration to many newcomers.

After several discussions and some experimentation, Allan has pieced together a simple but effective system for A-O-13 modes B and J. The goal was to find or build an antenna system to be used while on vacation around the United States and Canada. It had to work well, be easy and quick to assemble and disassemble, be lightweight, and store in as little space as possible in the custom van used for the trip.

The final solution came from Mike Duddy of Lightning Bolt Antennas. Mike produces a wide range of HF quads and delta loops ranging from simple two-element varieties for 10

Photo B. Allan N5LKJ checks the array balance and camera tripod controls for the Lightning Bolt OSCAR antenna system. (Photo by WB5RTT.)

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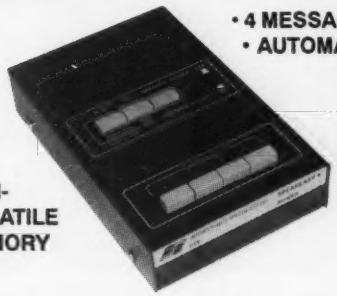

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Photo C. Allan N5LKJ demonstrates the "Armstrong" elevation control on the Lightning Bolt portable satellite antenna system to Andy WA5ZIB (right). (Photo by WB5RTT.)

meters costing less than $100 all the way to a two-element 40 meter monster for nearly $1,000.

Mike also produces quads for 2 meters and 70cm. One of his dual-band quads with two elements on 2 meters and four elements on 70cm was reviewed by Bill Brown WB8ELK in the December 1990 issue of *73*. The quad elements are all on the same boom, which for satellite work can cause desense due to the full-duplex nature of satellite operation.

Separate antennas on a cross boom like most home hamsat arrays provided the answer. Allan chose a 2 meter, vertically-polarized four-element quad on a square 46-inch boom in conjunction with a 70cm, horizontally-polarized seven-element quad on a square 43-inch boom. The two antennas mounted easily to a round 54-inch cross boom. To achieve good weight balance both antennas have centered mounting brackets.

Allan modified a heavy-duty camera tripod to hold the all-Fiberglas array. No rotators were necessary since the high-orbit satellites move slowly across the sky and the antenna beamwidth is relatively wide. Depending on the position of the satellite in the orbit, up to two hours of operation are possible without re-aiming.

First impressions on the air were excellent. Operating via mode B on A-O-13, Allan used a Yaesu FT-736R transceiver configured for satellite operation with an amplifier to generate about 70 watts output to the 70cm quad. A GaAsFET preamp connected to the four-element 2 meter quad produced easily-heard signals from the satellite. With short coax runs and the radios mounted in the van, Allan made several contacts through an average pass while the satellite was at apogee (its most distant point from the earth).

The complete antenna system is shipped and can be kept in a box 8" x 4" x 5" long. The 70cm quad elements fold down flat against the boom for storage. The 2 meter elements must be completely disassembled, but this doesn't take long. Assembly or disassembly (after some practice) takes about 10 minutes. The elements are made from a rigid special alloy wire so some care is advised. Hardware is aluminum for the mounting plates and stainless for the bolts and clamps. The U-bolts are not, but are treated to prevent corrosion.

Mike specializes in custom designs. Some may prefer a longer cross boom (up to 7.5 feet) while others may want N-type connectors (the standard is SO-239s for VHF and BNCs for UHF). The complete array, including the antennas and cross boom, sells for $114.90 plus shipping from Lightning Bolt Antennas, RD #2, Route 19, Volant PA 16156, or call (412) 530-7396. They take Visa and MasterCard and can usually ship within two weeks or less depending on the availability of Fiberglas parts. The system components can also be ordered separately. The 2 meter quad sells for $39.95, the 70cm quad for $49.95 and a 7.5-foot cross boom for $25. When a portable OSCAR array is ordered, Mike uses dimensions to peak the antennas on 145.900 MHz and 435.500 MHz.

Listen for N5LKJ somewhere in North America during the late summer and early fall. He'll be running the Lightning Bolt antennas along his route from Texas to Alaska, and back again via the East Coast. A-O-13 is his satellite of preference, but he may show up anywhere. 73

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HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8l1.2l" x 11") sheet of paper. You may also upload a listing as E-mail to Sysop to the 73 BBS /Special Events Message Area #11. (2400 baud, 8 data bits, no parity, 1 stop bit. (603) 924-9343). Please indicate if it is for publication. Use upper- and lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters 1 or i, or even the number 7. Specifically mention that your message is for the Ham Help Column. Please remember to acknowledge responses to your requests. Thank you for your cooperation.

Wanted: Manual and schematic for a TenTec Century 21 CW transceiver. *Frederick W. Gaines WA3NUG, 264 Hemlock Lane, Springfield PA 19064. Tel. (215) 544-2713.*

Sailors: Ham of 27 years and owner of 48 foot fiberglass sailboat, is seeking a donation of a good 12 volt HF transceiver, shortwave receiver, and antenna tuner in trade for future charters in the Caribbean. *Gary WB4CZE, (813) 463-4570.*

Needed: Donation of Moonraker or any 10 and 11 meter beam. I will reimburse for shipping. Please mark "gift" on package, and send to: *Pedro Bonnilla 5YX9517, Edif Universitario Local 2, Ave. Universitaria, Los Chaguaramos, Caracas, Venezuela.*

Wanted: Source for National INS8073 Microprocessor Chips (built in BASIC). Also, I would like to find a source for Standard Battery Nicad packs for Heath HW24 HT handheld. The battery is marked HWA-110. Heath cannot help in finding a source. *Charles Gelsinger N5PTK, PO Box 72072, Albuquerque NM 87195.* Thanks.

I am trying to locate schematics for a Siltronix Model 1011C, 10 and 11 meter transceiver. Also, schematics for a KRIS model Power Pump, 6 and 10 meter amp. I will pay all copy and shipping costs. *Bob Neal N6FWJ, PO Box 11, Scroggins TX 75480.*

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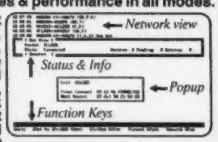

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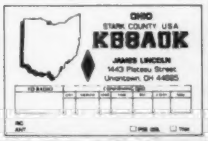

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Alphabet Soup

We hams and other technical types are very fond of acronyms. You know, AGC, ALC, PLL, DSP, and all those other mind-clogging letters that describe the silicon toys we love so much. This obsession even extends to our operating practices; we tolerate QRM, sometimes generate RFI (oops) and generally have a good time with RF on SSB and FM, where we might employ CTCSS and DTMF from an HT. Naturally, we enjoy HF, VHF, UHF and SHF (or is it EHF?). And let's not forget all the administrative stuff. If you're an ARRL member, you can be an SM, OO, OBS (Official Bulletin Station—honest!), and on and on. Ow, I'm getting a headache!

This being a technical column, I thought we'd take a look at some of the technically-oriented acronyms and what they really mean. Some of this may seem pretty basic, but you may find it useful as a refresher. Where appropriate, we'll delve into the specifics as much as possible.

Hams Do It With More . . .

Frequency. The essence of the radio art. Let's see, we've got HF, which stands for High Frequency and, for us, extends from 160 meters (1.8 MHz) up through 10 meters (28 MHz). Paradoxically, this is the part of the spectrum we call the ``low bands," simply because we have nothing lower allocated for our use; we have no LF! Even stranger, we call 160 meters, at the bottom of our spectrum, the ``top band." Who said all that RF to the brain was harmless?

Moving on up, we come to VHF, or Very High Frequency, which starts at 6 meters (50 MHz) and goes up to 440 MHz. Starting at 440, we're at UHF (Ultra High Frequency), which extends to about 1 GHz, above which the microwave bands begin. Officially designated SHF (Super High Frequency) or EHF (Extra High Frequency), we usually just call them microwaves.

Although there are no actual physical boundaries between the various areas of the frequency spectrum, propagation does change pretty dramatically between HF and VHF, so it makes sense that the two ranges are considered separate. Between VHF and UHF, though, the differences are subtle, so the reason for their being distinct is unobvious. Perhaps it has something to do with the differences in construction techniques required to implement circuitry which will work at those frequencies. At one time, 100 MHz was considered UHF, because it was still exotic and unexplored. As the frontiers of frequency have been pushed higher and higher, some of the frequency ranges have had their antes upped.

Gimme A Signal

Signaling schemes like CTCSS and DTMF arose in commercial services and were later adopted for ham use. CTCSS, or Continuous Tone Coded Squelch System, was originated by Motorola for their pagers and walkies and was (and is) known by their trademark ``PL," for Private Line. Because they own the name, though, the generic version we use required some other moniker. Hence CTCSS, which is quite a mouthful. It works like this:

A low-level audio tone is generated by the ``encoder" and mixed with your transmit audio. Its frequency can range from 67 Hz to about 250 Hz. Although it often is referred to as a ``subaudible" tone, it can be quite audible, especially if one of the higher tones is used. At 67 Hz, many radios' speakers can't reproduce it but, at 250 Hz, they all can, because that is right in the male voice range. The tone sounds like a low-level hum, and I've had many occasions in which I've had my CTCSS encoder on and had a friendly voice break into my conversation to ``inform" me that I had a hum on my signal!

When a radio or repeater equipped with a CTCSS decoder receives signals, it keeps its squelch closed until the decoder hears the correct tone, at which point the speaker comes to life. The technique has proven quite useful in situations where two repeaters are interfering with each other. Put them on separate CTCSS frequencies and they don't bring each other up. Naturally, that doesn't prevent interference when both are running at the same time.

Many modern walkies include, or offer as an option, CTCSS encoder/decoders. If you just want to access CTCSS-protected repeaters, you only need the encoder. But you may find the decoder handy as well. For instance, you can use it at hamfests to avoid constantly having your squelch tripped by nearby transmitters (other walkies) on adjacent frequencies. Also, you can use it through non-CTCSS repeaters. Very few hams seem to realize this. If you want to wait for a specific call but don't want to listen to the daily chatter, simply arrange with the calling station to use the CTCSS. Be sure to pick a high tone, though; many repeaters can't pass the low ones. Also, if you have your decoder on, be sure to check the frequency for activity before transmitting, because you can't hear when others are talking. And remember, using CTCSS in no way prevents others from listening to you; it just prevents your hearing them when you don't want to! Obviously, this little selective calling scheme won't work with a CTCSS repeater because you must send the tone it requires to open it up. Unfortunately, you can only send one tone at a time. Or can you?

Number, Please

One of the telephone company's greatest inventions was the DTMF, or Dual Tone Multi Frequency, system. They call it TouchTone. Like PL, that's a trademark, so we have to revert to its generic technical acronym. Originally developed decades ago to provide push-button telephoning, DTMF has found its way into radio in a big way.

The most popular use for it is in repeater autopatching, which lets you connect to the landline telephone network and place phone calls. In my experience, the facility to do that is, for non-hams, a very big attractant to ham radio. Nothing lights their faces up like hearing that dial tone coming from the speaker of a walkie!

Another important use for DTMF is repeater control. Most repeaters can be controlled over the air, using the tones. If you're a repeater control operator, it's awfully nice to be able to turn the repeater on and off, enable or disable CTCSS and control access to the autopatch, using an HT from miles away!

Although walkies have had DTMF number pads for years, only recently have they started being equipped with sequential decoders. These new rigs can decode three- to six-number codes, opening their squelches only when the proper combination has been received. They also can accept several different codes and display what has been received, so you can see who has called. Unfortunately, they all suffer one serious drawback. The coding scheme, which apparently has been standardized in Japan, allows the sending of only the digits 0 through 9; no # or * codes can be sent. Most repeater controllers, which are designed here in the US, can be set to disallow the retransmission of DTMF codes unless they are preceded by a special code. Many control ops set them up that way so that phone patch and control digits can't be heard on the repeaters' outputs. That special code, however, requires the use of the unavailable digits, making the DTMF signaling scheme useless through most repeaters. Of course, you can still use it at hamfests, but CTCSS is easier to set up and works just as well.

What Goes Around

PLL: I've discussed PLLs before in some detail, but let's go over the basics again. First, a PLL is a Phase Locked Loop, and is part of a radio's frequency synthesizer. It compares the frequency of an oscillator with a digitally-derived reference and adjusts the oscillator until it's on its intended frequency. A PLL has *nothing* whatever to do with PL. I hear the two terms confused on the air all the time. Most frequency-synthesized radios made today use PLLs, but there's another frequency-generating design now gaining popularity.

DDS: No, it's not another pesticide. DDS stands for Direct Digital Synthesis. In this relatively new technique, the local oscillator signals are generated digitally and then passed through a DAC (Digital to Analog Converter) to turn them into the required sine wave. Although it requires high-speed digital circuits, the method has distinct advantages over the PLL system because it is not constantly correcting a wandering oscillator, so it has much less phase noise.

The Three "A"s

They are: AGC, ALC and AFC. AGC, or Automatic Gain Control, is the receiver circuit that attempts to keep incoming signal fluctuations from affecting the recovered audio by compensating with the gain of the RF and IF stages.

ALC is sort of the same thing, but for a transmitter. It keeps you from overdriving the transmit PA (Power Amplifier) on voice peaks by adjusting the amplifier's gain. Specifically, it cuts the gain back as peaks occur. ALC is also used to keep the PA from overdriving an external linear amplifier. In that application, the ALC voltage is derived in the linear and fed back to the transmitter.

AFC is a system which keeps a receiver from drifting off the transmitter's frequency. It is usually found on FM radios in the VHF-and-up ranges, especially where there is no crystal or frequency-synthesized tuning.

Watch This

Hams use two forms of television, SSTV and ATV. SSTV refers to Slow-Scan TV, in which video information is slowed down and sent as audio tones representing still pictures. These tones occupy less than the allotted 3 kHz, so the pictures can be sent over HF. ATV refers to regular, wideband, full-motion TV, just like the kind we're all used to, and is found on UHF and higher ranges.

FAX, or Facsimile, signals are simply a paper-output form of image scanning. FAX has its own language, though, because it comes from other radio services. For one thing, there's IOC, or Index Of Cooperation. FAX machines used to wrap the paper around a drum. As the drum spun at some specific LPM (Lines Per Minute), an optical pickup (for transmitting) or a pen (for receiving) would slowly move down the drum, creating an extended spiral pattern of lines and scanning the entire image. The ratio of the speed of the drum to the speed of the pickup or pen's linear motion was the IOC. Although computers are now more common for FAX, the technique and its terms still apply.

Well, there's no end to the acronyms, but I hope this at least covers some of the more common ones. Don't forget to watch out for TVI, QRM and QRN, and keep the PHT (Powerful Headache Tablets) handy!

73 and see you all next month! 73

Packet + AMTOR = PACTOR!!

PACTOR is a new ARQ radioteletype mode developed in Germany. The protocol has been described in CQ-DL and QEX publications.

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HART PUBLISHING

John Hart NØOCF, owner of Hart Publishing, has announced the publication of the fourth edition of the *Amateur Radio Mail Order Catalog and Resource Directory.* This July 1992 edition has 220 pages and more than 1,200 entries of mail order products and services for hams. The catalog is categorized and alphabetized into easy-to-find headings from "Antennas" to "Weather Instruments." Listings include the name, address, phone and fax number of the vendor, plus a description of products or services. Also included are new, non-radio-related listings, such as environmental organization BBS's. The catalog also has the complete *Ham-Soft Shareware Catalog* included. The *Resource Directory* part contains a "Directory of 100+ Free Catalogs," a "Directory of Catalogs for a Fee," a "Directory of Radio Clubs," and much more.

To maintain accurate listings, the catalog is updated and published twice a year. A two-issue subscription is $20 ppd. in the U.S., $25 ppd. foreign; the single issue price is $12. Contact *John Hart NØOCF, Hart Publishing, 767 South Xenon Court, Suite 117, Lakewood CO 80228; (303) 987-9442.* Or circle Reader Service No. 206.

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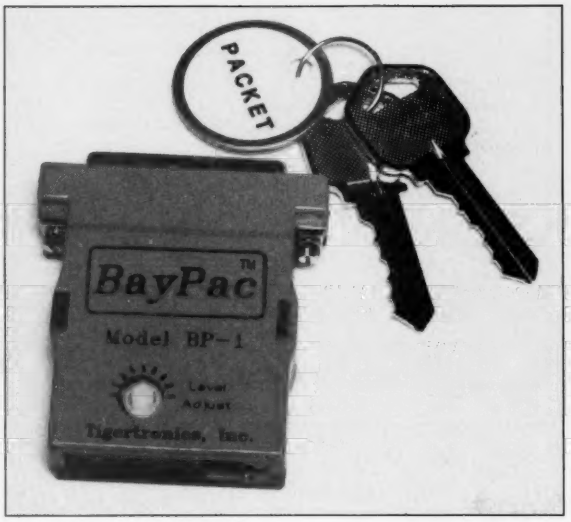

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Tigertronics has announced a revolutionary breakthrough in packet technology with the new Model BP-1 Packet Modem. Specially designed to work with TNC emulation programs like BayCom and SofTnc, the BP-1 transforms an IBM compatible computer into a full-featured packet controller. Extremely easy to install, the BayPac simply connects between the computer's serial port and the radio with a small four-conductor cable. This radio cable features a "quick connect" plug, allowing the modem to be moved very quickly to other radios (base, mobile, hand-held). The Digital Signal Processor in the BP-1 is crystal-controlled, auto-calibrating, and never needs alignment.

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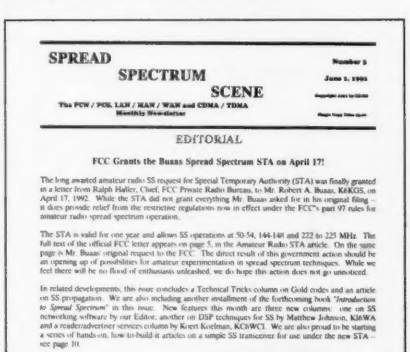
SPREAD SPECTRUM SCENE

The *Spread Spectrum Scene* newsletter is published for the interchange of the latest news and information about the growth, regulation and opportunities in the evolving technology of spread spectrum. Covering PCN, PCS, LAN, MAN, WAN, CDMA and TDMA technologies, the newsletter is intended for the working professional as well as the experimenter, student and amateur radio operator. Monthly features include: International and Washington reports; a spread spectrum networking software column; a DSP column; a Technical Tricks column on hands-on spread spectrum techniques; antenna and propagation articles; serialization of a new book on spread spectrum and reader contributions on subjects relating to spread spectrum.


SPREAD SPECTRUM SCENE

Number 5

June 1, 1992

The PCN / PCS, LAN / MAN / WAN and CDMA / TDMA Monthly Newsletter

EDITORIAL

FCC Grants the Buans Spread Spectrum STA on April 17!

The long awaited amateur radio SS request for Special Temporary Authority (STA) was finally granted in a letter from Ralph Haller, Chief, FCC Private Radio Bureau, to Mr. Robert A. Buan, K6KGS, on April 17, 1992. While the STA did not grant everything Mr. Buan asked for in his original filing – it does provide relief from the restrictive regulations now in effect under the FCC's part 97 rules for amateur radio spread spectrum operation.

The STA is valid for one year and allows SS operations at 50-54, 144-148 and 222 to 225 MHz. The full text of the official FCC letter appears on page 3, in the Amateur Radio STA article. On the same page is Mr. Buans' original request to the FCC. The direct result of this government action should be an opening up of possibilities for amateur experimentation in spread spectrum techniques. While we feel there will be no flood of enthusiasts unleashed, we do hope this action does not go unnoticed.

In related developments, this issue concludes a Technical Tricks column on Gold codes and an article on SS propagation. We are also including another installment of the forthcoming book *"Introduction to Spread Spectrum"* in this issue. New features this month are three new columns: one on SS networking software by our Editor, another on DSP techniques for SS by Matthew Johnson, KI6WA and a reader/advertiser services column by Kiori Kveiman, KC6WCI. We are also proud to be starting a series of hands-on, how-to-build-it articles on a simple SS transceiver for use under the new STA – see page 10.

Table of Contents

Article Page
SS Events 2
Reader & Advertiser Services 2
Letters 4
International Notes 6
Washington Notes 6
Amateur Radio STA 8
SS Network Software 9
DSP for Spread Spectrum 9
Technical Tricks 10
VA Propagation 10
Introduction to Spread Spectrum 12
Build Your Own SS STA Transceiver, Part 1 14
New Products 31
July 5th Preview 32

GOOD NEWS AND BAD NEWS

Watch for SS Legislation Soon!

Watch for US House and Senate action, very soon, on several bills introduced last year that may greatly affect the future of commercial spread spectrum on the air operations in the US. Senator Daniel Inouye (D-Hawaii) introduced S.218, the Emerging Telecommunications Technologies Act of 1991 last year – it is again on the docket for Senate consideration. Last year's companion House Bill, sponsored by John Dingell (D-Michigan), Don Ritter (R-Pa.), Michael Oxley (R-Oh.) and Billy Tauzin (D-La.) are also due for action soon. All of this activity is the result of some significant pressure brought by Apple Computer and the joint actions of the FCC and the OTP Whitehouse.

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41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230
231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280
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146	Creative Control Products	37
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9	EasyTech	45
•	Eavesdropping Detection	37
•	Electronic Distributors	47
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•	Emcom Industries	27
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228	Forbes Group	11
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•	Greater Louisville Hamfest	31
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86	MFJ Enterprises	1
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44	Network Qsl Cards	69
161	NX2P Electronics	71
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26	Quantum Instruments	81
132	Quement Electronics	56,76
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244	Software Systems	20
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142	Star Electronics	25
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•	The Ham Center	27
150	The Radio Works	43
269	**Tigertronics**	**57**
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22	Tri-Ex	56
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Notes from FN42

Just a couple of quick notes before we get to the international news. I received some additional information concerning language study books. Rodney Jackson WA9NZF has brought another source of books to our attention, in addition to that from David Cowhig WA1LBP.

"There is not only one book, but there are five books in print to assist U.S. (or English-speaking hams) with foreign QSOs. And yes, one of the books includes Japanese. In fact, it is the reason I purchased the book. The books are the brainchild of 'Rose,' the wife of a ham in Mundelein, Illinois. The books are advertised in 73 Magazine. *'Rose' now has four books in print. Each book covers four different languages in addition to English. For example, in Book 1 there is Spanish, German, French, Polish, and Japanese, plus English. Each language has 41 pages of QSO information covering antennas, openings, closings, colors, days of the week, greetings, hobbies/interests, locations, and others. Every language section is the same. For instance, on page 13, phrase number seven is 'My QTH is (2) km south of Chicago,' no matter what the language. Computer generation is wonderful for this!*

"Book 2 covers Swedish, Italian, Portugese, Norwegian, and Serbo-Croation. Book 3 covers Russian, Danish, Czech, Korean, and Hawaiian. Another book covers Chinese, Dutch, Finnish, Romanian, and Vietnamese."

I found the ad for "Rose" in one of the issues and each volume costs $10 US (or $12.50 US for shipping outside the US) and can be ordered from Rose, P.O. Box 796, Mundelein IL 60060-0796. Tell them that Rodney and Wayne sent you. Rodney comments that the books are spiral-bound, lay flat, and are of excellent quality for the price. Rodney says, "Ga suki desu (I like it)."

I want to correct an unintentional error on my part. David Horsfall has brought this error to my attention. I have used the word "Transportation" in the past instead of the word "Transport" in the Australian portion of the column. Just to keep the record straight, the correct usage is "Department of Transport and Communications."

And now on to the news from around the world.—73, Arnie N1BAC

Roundup

Democratic People's Republic of Korea (Pyongyang, North Korea) Letter from Josef Zabavik OK1DTG, dated 28 April 1992: Dear Friends! I allow myself to write a few sentences to you. I am a faithful reader and would like to describe my attempts to propagate our sport during one year of my stay in North Korea.

Just after arriving in this country, in April 1991, I requested (in written form) a local licensing organization to give the official licence for radioamateur broadcasting activity. My request was delivered via the Post Office and then via Diplomatic Post (a diplomatic note). Because of the lack of a response until September 1991, I repeated my request six more times, from September 1991 to March 1992, but still no answer. My requests were also directed to the Korean People's Army (KPA) which is responsible for the communication services in the D.P.R. of Korea.

In April 1992, when I was about to finish my stay in this country, I received information from the staff of the KPA (from the Chief Protokol). I was told in principle that they didn't have anything against my radioamateur broadcasting activity in the 40 meter band with output power of 10 watts. I wanted to receive this information in written form but I was told that it would be given to me later.

On this basis I started my work on 12 April 1992 in the 7 MHz band using the callsign OK1DTG/P5 and worked until 24 April 1992 when I asked the KPA once more to give me their permission in written form. In the meantime the day of my departure from North Korea was coming very near and I still had no physical proof of my efforts to receive written permission to operate. Since I didn't want to endanger my callsign, OK1DTG, I stopped communicating after approximately 500 QSOs on 7 MHz.

I am sending a similar letter to the Amateur Radio Relay League and am asking them to recognize my efforts to receive official permission for my activity from North Korea.

It is hard to imagine how hard the living conditions are and that it is almost impossible to gain something and to have to urge the government to give you a final answer to a request. I think that this place will be inaccessible for our sport for a long time to come if this lack of communications continues.

Josef Zabavik, OK1DTG, UNCSF-JSA(JDO), Czechoslovak Delegation to the NNSC, APO AP 96 25/-0417, USA; or Ohradni 1361, 140 00 Praha 4, Czechoslovakia.

Japan (From the JARL News):

JARL & CRSA RELATIONS

Mr. Qin Duxun, President of the Chinese Radio Sports Association (CRSA), arrived in Japan on February 15th, accompanied by Mr. Wan Xun, Deputy Secretary-General. Upon visiting JARL's headquarters, they exchanged lively talks with President Hara JA1AN, and other staff members. With renewed determination, both sides discussed in earnest about promotion of friendly relations between their two countries through means of amateur radio and following an exchange of opinions, it was agreed that the ties of friendship already existing be further strengthened.

Photo A. Josef Zabavik OK1DTG/P5 and ham shack while in Pyongyang, D.P.R. of Korea (North Korea).

Scotland From "Paddy" McGill, GM3MTH: The Scottish Tourist Board (Radio Amateur) Expedition Group is listing two expeditions for August. The first will take place on August 1st from Pollok Park in Glasgow, home of the Burrell Collection and Pollok House, birthplace of The National Trust for Scotland, established in 1931. The callsign used will be GB8PP.

The second expedition will happen August 22-23 at the 3rd Annual West of Scotland Steam Fair at the Summerlee Museum in Coatbridge. The callsign will be GB6SM.

The normal times for the events are: Saturday—0800-2200 UTC and Sunday—0900-approx. 1500UTC. For a List of Events/Information Pack write to: John (Paddy) McGill, GM3MTH, 9, Ramsay Pl., Coatbridge, Lanarkshire, Scotland, ML5 5RE. Enclose two second class stamps or the equivalent for return postage.

Switzerland From the International Telecommunication Union (ITU) Press Release: Azerbaijan and Estonia became the 167th and 168th members of the ITU in April 1992.

Azerbaijan is situated on the south-eastern flanks of the Caucasus Mountains and is bordered by the Caspian Sea, the Islamic Republic of Iran, Russia, Armenia, and Georgia. It has a land area of about 86,600 square kilometers and a population of approximately 7,029,000, of which 1,757,000 is in the capital, Baku (1989).

Estonia is bounded west and north by the Baltic Sea, east by Russia, and south by Latvia. Its population size is 1,573,000 (1989) of which 482,000 live in the capital city of Tallinn. Its main economic activity is agriculture and dairy farming. Estonia has also rich high-quality shale deposits, peat deposits, and phosphorites. But the degree of expertise of its work force favours the development of light industry (textile, woodwork, radio equipment and electronics, and measuring equipment).

The accession of Azerbaijan and Estonia follow that of Lithuania (12 October 1991) and Latvia (11 November 1991). The former USSR Republics of Belarus and Ukraine have both been members of the ITU since 7 May 1947.

WORLD TELECOMMUNICATIONS ADVISORY COUNCIL

Senior representatives of the telecommunications industry have agreed to create a World Telecommunications Advisory Council (WTAC). The initiative was taken in response to a recommendation made by the High-Level Committee. The High-Level Committee was established by the ITU Plenipotentiary Conference to recommend structural reforms to respond better to the changing nature of the telecommunications environment, and particularly, to respond to the challenge posed by the greater dynamism, creativity and competitivity of a number of new partners.

The Council aims at providing the ITU with strategic advice from the public and private sectors on the telecommunications environment and how, in the light of its dynamic nature, the Union's principal activities could be carried out more effectively.

Its purpose is also to consider the state of global telecommunications network and services, monitor its growth and make recommendations for the promotion of the harmonious worldwide development of information technology, for the well-being and betterment of mankind. In addition, the Council will work to raise awareness among financing institutions and governments in developing countries of the importance of investing in telecommunications.

Further information can be obtained from: Mr. Terrefe Ras-Work, Executive Secretary of WTAC, International Telecommunication Union, Place de Nations, CH-1211 Geneve 20, Switzerland.

Ukraine From the Prometheus Ham Digest (PHD) of the Prometheus Amateur Association (PAA): The front page article of the Digest is an Open Letter to Mr. V.I. Delikatny, Minister of Communications of the Ukraine from V. Kiyanitsa, Executive Secretary, RSF of the Ukraine. The topic addressed the problem of letters being sent to Ukraine hams by foreign hams being opened, contents being removed, and sometimes the remains being sent on or "lost."

V. Kiyanitsa ran an experiment hav-

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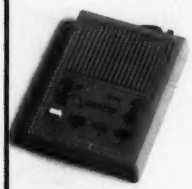

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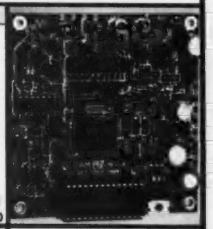

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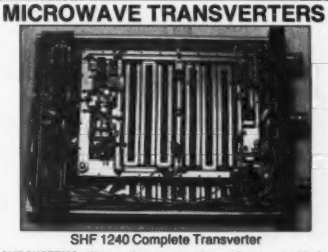

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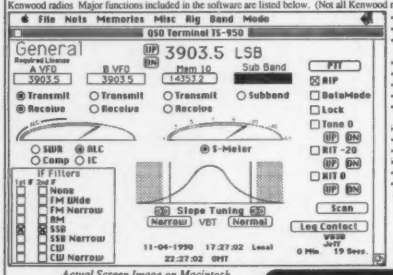

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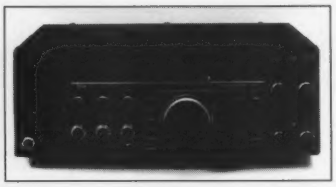

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ing 27 letters mailed to him from abroad with one to two IRCs enclosed. Only three letters made it to him!!! "I only hope that you, Sir, will investigate the problem thoroughly and will be able to stop what is going on since it influences the international prestige of the Ukraine."

[For those of you who have not received QSL confirmation from Ukraine hams, or even those in other countries, this may be the reason. Don't blame the hams themselves unless you have positive proof! At least one country is attempting to correct the problem.

PHD has been published by PAA since August 1991. One-year subscriptions are available for US$12 from PAA, c/o George Yankopolus, 13 Glen Meadow Drive, Glen Mills PA 19342, USA. Letters, pictures, articles, etc., should be submitted directly to the Editor, Alex Ulyanich RB5IJ, Box 1, Enakiewo 29, Konetskaya Oblast, 343820 Ukraine.—Arnie]

AUSTRALIA

David I. Horsfall VK2KFU
PO Box 257
Wahroonga NSW 2076
Australia

There is not much news at the moment that has not been covered before—the "Code-less Novice" is still on its way, the "CW Forever" brigade are still fighting a rear-guard action, and the ROSE/NetRom protocol wars continue unabated, with various personality clashes and claims of theft and vandalism of packet switches.

The Department of Transport and Communications (DoTC) has released an information paper—RIP-73A—which provides information for overseas operators and covers reciprocal licences and temporary permits. It is worthwhile reproducing the highlights here. Overseas amateurs visiting Australia fall into three categories:

CATEGORY A: Amateurs from countries having a reciprocal licensing agreement with Australia. These countries are: Canada, Denmark, France (and New Caledonia), Germany, India, Israel, Japan, Malaysia, New Zealand, Papua New Guinea, Poland, Singapore, Solomon Islands, Spain, Switzerland, United Kingdom, and United States of America. Amateurs visiting for less than a year will be issued with a temporary non-renewable permit. Amateurs intending to stay will be issued an Australian amateur licence.

CATEGORY B: Amateurs from countries having no reciprocal licensing agreement with Australia but having qualifications/licences with a recognised Australian equivalent. These countries are: Argentina, Falkland Islands, Greece, Hong Kong, Indonesia, Ireland, Italy, Luxembourg, Malta, Nauru, Netherlands, Norway, Philippines, South Africa, Sri Lanka (Ceylon), Sweden, Vanuatu, and West Indies (Cayman Islands). Amateurs from these countries, regardless of their residential status, will be issued a non-renewable temporary permit for 12 months.

CATEGORY C: Amateurs from countries having no reciprocal licensing agreement with Australia and no recognised Australian equivalent qualifications/licences. Amateurs from these countries, regardless of their intended residential status, will be issued with a non-renewable temporary permit for 12 months, permitting 10 watts (mean power) FM telephony in the 146-148 MHz band only [this looks suspiciously like the proposed Code-less Novice licence!].

It is preferable that you apply for a licence in person so that the original documents can be sighted and a licence issued over the counter. Applications are accepted by mail, but please allow three months so that the licence can be forwarded to you before you depart for Australia. The following documents are needed: (a) a copy of your amateur certificate and passport (with English translation), certified by a public notary (mail applications only); (b) a completed licence application form (RF-57); (c) your current licence, or a certified copy, with English translation; (d) proof, such as a visa, that your visit is for no longer than 12 months (visitors only); and (e) the current licence fee of $35 (Australian). Cheques or money orders are to be payable to the "Receiver of Public Money."

Note that whilst licences are renewable annually, temporary permits are not. If you are granted an Australian licence or permit as a visitor, it cannot be used to obtain a licence in other countries. Also, Australian operating conditions, e.g. power levels, etc., must be adhered to. Finally, an Australian licence, temporary permit or callsign can only be used with Australia, its territories, or territorial waters. Further information can be obtained from the Department of Transport and Communications in each state, or from the Wireless Institute of Australia, P.O. Box 300, Caulfield South, Victoria 3182, Australia.

This was longer than I intended, so in the next column I'll briefly summarize the Australian licensing scheme, the power levels and modes, etc., and how to tell an operator's grade of licence from his/her callsign. Cheers for now. Those with access to Internet or packet can contact me as "dave@ips.OZ.AU" and "VK2KFU@VK2RWI.NSW.AUS.OC" respectively. 73, Dave VK2KFU.

BULGARIA

Milen Postadshieff
PO Box 237
7000 Russe
Bulgaria
Packet: LZ2MP@HB9AK.CHE.EU or LZ2MP@DKIØMTV.DEU.EU

DIGITAL MODES IN BULGARIA

The first serious RTTY activity in Bulgaria started around 1974 at the student radio club LZ1KDP in Sofia, the capital city of Bulgaria. They were using a mechanical RTTY machine donated by the German Amateur Radio Teleprinter Group (GARTG). Until 1986 some other stations were active on RTTY from Bulgaria, but two stations stood out as the most prominent: LZ1KDP and LZ2KRR.

In January 1986 LZ2MP and LZ2XA activated the Student Radio Club

LZ2KIM at the Technical University in Russe on RTTY using an Apple II+ compatible computer, a home-brew T.U. with active filters, and a simple RTTY program. This proved to be the first "computerized" RTTY station in Bulgaria. In May 1986, using the RTTY setup and a Hamtext program from Kantronics, LZ2MP activated the club station LZ2KIM on AMTOR, which was also a first for LZ land. Finally, in March 1987, running a home-brew 300 baud modem and a DL2MDL AX.25 program, LZ2KIM was activated on HF Packet. Again, this was the first packet activity from Bulgaria.

Today there are about 20 RTTY setups in Bulgaria but quite often hams who do not have RTTY capabilities at home use the club equipment under their own callsigns. Consequently, you may have heard many more LZ stations on the air. Most of these stations typically consist of a home-brew Apple II compatible and T.U. with active filters.

On AMTOR there are about five stations currently active. For this mode most of the hams are using Apple II, home-brew T.U. with active filters, the HB9BCS AMTOR/RTTY program or a home-brew AMT-1 look-alike unit.

About 15 packet radio set-ups are in use here. We don't have any VHF/UHF packet networks here because of the lack of equipment, so most of the activity is on HF or on direct links within the same QTH. A typical packet set-up consists of an Apple II compatible, a home-brew modem with the DL2MDL AX.25 program or home-brew TNC2 look-alike unit.

It is not too difficult to build a home-brew Apple II look-alike here, and lately even factory-built ones are available at a reasonable price. IBM PC/XT compatibles are also available lately but they are extremely expensive, so the digital activity is increasing very rapidly.

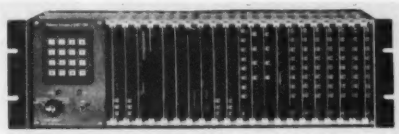
With the political changes during the past few years some surplus military and police equipment that can be modified to 2m FM has become available but it is not very easy to get and can be a bit expensive. Last year the first three 2m FM repeaters were installed. Two of them are high in the mountains and are accessible from almost all locations in Bulgaria. There are approximately 200 hams who have equipment for 2m FM, most of it crystal-controlled. We hope that by the end of this year there will be several packet digipeaters and even packet nodes installed in Russe, Sofia, and some other places, so probably within a few years more activity will take place. The countries around Bulgaria are not connected to the European Packet Net but we have high hopes for the future, maybe even an HF APLINK system from here to connect to the rest of the country and the world. Initial experiments are in progress at LZ2MP and LZ2KIM. Watch out world, here we come!

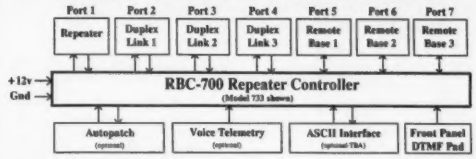
73, Milen LZ2MP.

73

MULTIPLE REPEATER - LINK - REMOTE BASE CONTROLLER

Finally a controller that has solved control and audio interconnect problems between multiple radios. Your radio system can grow to multiple sites and stretch for hundreds of miles - and yet any radio can be fully controlled from any designated input.





The RBC-700 Repeater Controller is designed to support Repeater systems that require multiple radios connected together at a site. The RBC-700 utilizes a true 7 x 7 audio matrix switch which allows several conversations between ports at the same time. In the illustration above the 733 model is supporting a Repeater, 3 Duplexed Links to different sites, and 3 Remote Bases. Using simple commands, a user could tie the Repeater and a Remote Base to one Link, while the other Links are communicating through your site, holding separate conversations. Or, connect all of the ports together - like a big party line !!

Several models are available and are software configurable to support up to 3 Repeaters, 5 Duplexed Links, and 4 Remote Bases. A group or club can start with the basics and **expand** their controller anytime by simply adding boards and software. Free software upgrades for one year after delivery. Finally, a real controller for the Linked system operator !

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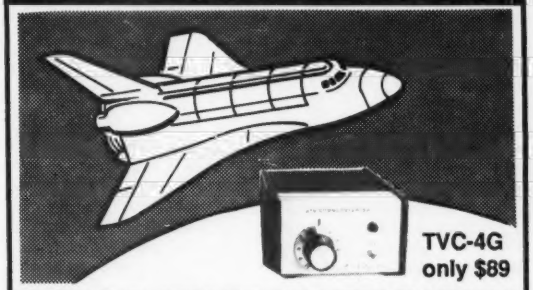

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Continued from page 4

attitudes? Well, we can start by admitting that punishment has never worked as a good teacher. Yes, these crummy people have robbed, beaten, raped and so on. They certainly deserve to be punished, right? So let's teach them a lesson by locking them up for a few years and making life rotten for them. Let's get even.

Well, that may be satisfying to the victims, but we know now that the whole process only makes things worse—resulting in even more victims. And knowing how lousy prison is, plus having had a master's education in crime while in the joint the last time, they're even more nasty to their new victims and harder to catch. So should we molly-coddle them instead? Then we come off as suckers and they were right to take advantage of us.

Okay, here's my proposed solution to the prison problem. First, in order to get costs down I propose two approaches. One is to put prisons where it's less expensive to keep people. Let's start looking for contracts from private prison companies with facilities in the low-rent areas of the world. It's obviously a lot less expensive to store people in tropical third-world countries than in Massachusetts—even counting the transportation. If I were going into the prison business I'd check out Chad, Burkina Faso, Guam, Indonesia, Mexico, and perhaps even China. I think some of these places would make it possible to keep prisoners for a tenth the cost in the U.S.

With modern electronics it's easy to keep track of prisoners by putting a small neck transmitter unit on them which will sound an alarm if they go beyond their allowed area. That saves on building walls, cells and guards. We can even add a microphone and record what they're saying and hearing. A nearby recorder can store months of voice-quality digital audio recording. Hey, we didn't guarantee them privacy.

Now there's the little matter of reforming their behavior. We know that punishment just doesn't work, so let's think in terms of rewards for good behavior. For instance, the normal prison chow could be very basic slop—enough to keep them from starving, but still slop. To get better food they'd be permitted to work in co-op gardens and grow meat, fruit and vegetables. They get to eat better if they work. That's positive reinforcement for the old work ethic.

As a prison company I'd solicit bids from companies interested in setting up some plants to use my prison labor. A study of the raw materials available and the markets within easy shipping distance would result in a list of products which could be made at a profit. Forced labor? Nah. Again, the prisoners would have the choice of a bare minimum existence or else working and earning credits which could be used to rent a TV, video cassettes, audio cassettes, a boom box, nice furniture, and other comforts. They'd be learning skills which will help them rejoin society and get work when they're released.

Knowing that they're being recorded 24 hours a day and that authorities can at any time review the tapes might keep down antisocial behavior. Computers can even keep track of when any two or more prisoners are together, but not talking—suggesting they may be plotting something by writing instead of talking.

The prison-run businesses should be able to cover the costs of running the prisons, even turning a small profit. That's a lot better than socking taxpayers $25,000 and up a year to store more and more criminals. We might even want to charge them for the police and court costs of catching and convicting them, letting them work off those costs with part of their prison earnings. That would lower the taxpayer burden even further.

And, after all, it was their decision to break the law, which caused us the expense, so why should we have to foot the bill for catching and convicting them?

If they do commit more crimes when they get back and get convicted again, let's hope the judges make their prison terms much longer. After all, sending them away for re-education isn't costing us anything. For that matter, we might stop paroling really serious offenders since life in prison wouldn't be the misery it is now.

This system is aimed at trying to overcome the poor education we've forced on the poor. It isn't going to be as helpful to the worst criminal cases. But we can still store these crumbs in much less expensive areas of the world, fencing them in with an electronic bracelet with stun power if they get out of line or try to escape.

Between a good preschool education which will inculcate positive role models, a spirit of cooperation and an interest in learning, followed by cooperative education private schools, paid for via vouchers from the state, we can break the whole poverty system so we don't end up with street gangs substituting for failed families. Kids need to feel they belong to a group, so if the family is kaput, they depend on the gang.

The nice part of all this is that we'll be able to get rid of welfare, chronic unemployment, police and court costs, and prison costs, plus we'll be able to cut our educational costs by about 50% and still end up with better schools, complete with computers and satellite communications for distance learning courses. And the kids will be learning skills, plus how to be successful in the information age—successful in their work and life.

The past immigrants from Germany, England, Poland, Ireland, Italy and so on all proved our melting pot system worked. Within two generations their kids were Americans and spoke American. Now let's convince the blacks to stop being Afro-Americans and refusing to speak our language. And let's get the Hispanics to stop being Latin Americans and speaking Spanish. Let's aim at all being Americans and speaking American.

Once we get kids starting their education right from year one we'll be turning out a whole new generation of high-tech-enthused kids—and we'll have young hams by the millions—plus young computer hackers, and so on.

What Are You Going to Do?

If you agree that the above plan will work, will you do anything about it—or will you nod and hope someone else will do something? As a product of our school system where you've been trained since day one not to cause trouble, where you were squashed by teacher intimidation and humiliation, I can understand why it might be difficult for you to actually do something—like write to your two senators and your representatives, maybe sending them a copy of my plan.

How about your state senators and legislators—know any of them?

If there are any of my ideas that you disagree with or don't think will work, drop me a line. The above is a very abbreviated description of my plan, so I've had to leave out all of my references and extended explanations. I'd list a bibliography, but I doubt many of you will want to go to the expense and time to get and read so many books. I must admit that few of my educational plans are original—most have been tested and found to work superbly—some in hundreds of schools.

Now, if we can get rid of poverty, inner city gangs, crime and drugs, about all we'll have to worry about is health care and the national debt. I'll start working on those next week.

Exporting Jobs

More and more unskilled and low-skilled jobs are being exported to lower-wage countries. The displaced American workers are all upset and are pushing us to "buy American." Where this means buying lower-quality products for higher prices, this is not entirely realistic. As world transportation costs drop and world communication systems improve, more and more low-skill jobs are going to move to low-wage countries.

So what do we tell the $12 an hour automobile worker who's been replaced by a Mexican who's working for $1 an hour? He's mad! Here he's been doing his job, obeying the union rules for the last 20 years, and suddenly the plant is closing.

One answer is not what the angry unemployed worker wants to hear. We might ask him how much of his spare time he's spent in educating himself vs. how much he's spent bowling, watching TV, drinking with his buddies in the neighborhood bar, buying RVs, going on vacations, and so on? Has he been loafing for 20 years and now is suddenly faced with having to pay for that wasting of his life? How much should the government be responsible for bailing out people who have made no effort to protect themselves against changes the future might bring? When the automobile came along was it the government's responsibility to save the buggy whip manufacturers and their employees?

If instead of wasting all of their spare time the angry displaced workers had invested even a small amount of their time in building other skills, the moving of their jobs to Mexico or China would be an inconvenience, not a disaster. Could they have taken a mail order course in accounting, real estate, telemarketing, selling, refrigerator repair, electronics, and developed alternative skills? Could they have invested some time in a hobby with potential business applications? Amateur radio, besides being fun and a relatively inexpensive hobby, also can lead to employment in repairing consumer electronics, computers, security sales and service, facsimile, paging, radio broadcasting, and so on.

Learning to play an instrument can provide not just a safety net job, but also provide a fun spare-time income. Learning to write means developing another skill which is in desperately short supply—one which provides many opportunities for spare-time earnings. This can easily lead to making money with desktop-publishing-produced newsletters.

One has to be almost blind not to see what's happening. The low-skill manufacturing jobs are moving to low-wage countries. More and more of them are going to go, leaving bewildered low-skill, high-wage workers behind demanding that the government *do* something. Senator Kennedy will introduce bills to stop this carnage and to force manufacturers to pay higher wages for poorer work. President Bush will "understand the pain" these displaced workers are suffering.

Worse, as more immigrants arrive, willing to work for almost anything in order to get started, even low-skill service jobs are going to be taken away from middle-class Americans and taken over by people willing to work for less. And I don't see any sign of our building a Great Wall across our Mexican border, so we're going to have plenty of immigrants for a long time to come.

How About The Unions?

Union membership has been dwindling for many years. Their ability to protect low-skill, high-pay jobs is being blown away by foreign competition. Unions were needed in the late 19th and early 20th centuries, when some manufacturers took terrible advantage of workers. But, having watched the printing and stagehand unions at work close up, the cure has turned out to be as bad as the disease in some instances.

When I worked at WPIX in New York as a cameraman, I watched the stagehands drawing amazing salaries

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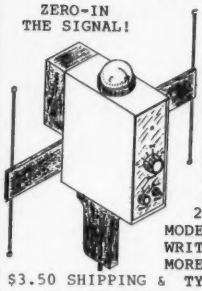

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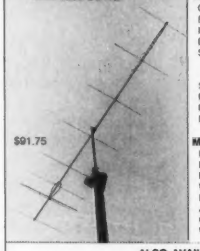

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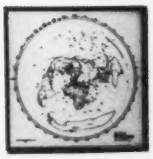

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for completely unskilled work. Their union was closed, allowing few but the sons of union members to join. They had a closed shop with every theater in town, plus the TV stations. So there I was, a skilled engineer and cameraman, making one-fourth the stagehand wages.

When I started publishing *73* in 1960 I had it printed by a union printer—which was all there was available. I watched 40-year veteran printers who were drawing as much as those stagehands and unable to specify type to fit into an ad. They'd have the type set over and over until it finally fit. There was no way to fire these dummies, so the printing company eventually built a new plant in Connecticut and closed their Manhattan plant, mainly to get rid of them.

I watched one New York newspaper after another being put out of business by union strikes. The unions fought every cost-cutting effort by the papers. When Varityper came along with a faster and less expensive way to set type the unions refused to let newspapers use it. If you're not familiar with the railroad union battles to preserve featherbedding, you need to read some history.

The *Reader's Digest* has printed endless stories of union viciousness during strikes. Killing people, destroying buildings, cars, buses and trucks. The chap living next door to me when I was a kid had had both of his legs broken by the union, crippling him for life. He'd been a ship's captain and, under orders from the shipping line, tried to hire scabs when the union struck the line.

The automobile unions have to share in the responsibility for the loss of so much of our car industry. Their semi-skilled workers were making over double the average American wage—in addition to turning out shoddy cars—making it easy for the Japanese to compete. Yes, the Detroit car execs share in the blame for what happened, with their lack of foresight and lousy planning.

With today's worker mobility, and the export of low-skilled jobs, it may be time to reconsider the role unions should be playing. Just as we're seeing the weakness of the adversarial approach to business and government relations, perhaps we should consider some way for unions, management and government all to work toward a cooperative consensus which will help make America more competitive.

In the meanwhile it might be helpful for a few million low-skill American workers to be encouraged to come to grips with the way the world is changing and understand the importance of building alternative skills and interests. There's never going to be a big market for people with great memories for baseball statistics or positions open for soap opera watching. Watching most TV, sports and games is a way of getting through life without having to think or do anything. These fight off the boredom of just sitting around. The rewards are so meager as to be worthless. Ditto 99% of news watching and, at least in my perspective, reading newspapers.

What should we be doing with our time? If we think in terms of developing marketable skills we won't go far wrong. And if we can tie these into a hobby, all the better. Computer programming, for those involved, is exciting fun. It's incredibly exacting, which is part of the fun. Photography makes a great hobby—plus it offers plenty of opportunities for making money. Many hobbies can be escalated into small businesses. We've got hundreds of ham radio operators who've started their own businesses and are doing fine. They're not really entrepreneurs, they're more interested in having their own business and not having to work for someone else.

I tend to encourage people to get into desktop publishing with a Macintosh system since it's relatively inexpensive and easy to learn to use. There are needs for so many publications that I doubt a week goes by that I don't come up with a niche that desperately needs filling. I'd love to start a new magazine a month—if I could find people with the skills to turn 'em out. I've got plans for one in the construction industry, one in the vacation business, a couple in education, a couple political, two for the video industry, and so on. So where do I find people who've skills in selling, writing, editing, photography, advertising, promotion, mail order, and so on?

Making The Time

Changing habit patterns is difficult. Ask any fat person who's tried to diet—and they all have—and they've all failed, elst they wouldn't still be fat. Habits are tough to break—particularly bad habits. And this obviously holds for the habits preventing people from developing skills and building knowledge. Our educational system has exacerbated this problem by rewarding us quickly for small achievements. This has resulted in a generation (or two) of Americans who find it difficult to concentrate on long-term goals. Getting thin, no matter what headlines you see in the supermarket tabloids, takes a long-term commitment. So the more determined dieters take off a few pounds and then quickly bloat up again. The less determined don't make it past the nearest ice cream store.

Just imagine how much time you'd have if you didn't waste it with activities which have no long-range benefits for you. Gone would be the six-packs. Gone would be the ball games. Gone would be sitcoms. Gone would be soaps. Gone would be a lot of idle chitchat. Gone would be 98% of the movies. Gone would be a lot of pop music, pop books, and pop magazines such as *People* and *Self*. If you cut out your wasted time, how much would you have available to build your skills? How much could you devote to your kids and their education? How much to your marriage? How much even to building your career? Could you spend some time teaching? We are in desperate need of elmers to help prospective hams learn about electronics and amateur radio. Of course, if you only memorized the answers to get your ticket, you're not going to be much of an elmer.

First, let me explain that from your letters and talking with you on the air, I know that 90% of you are painfully uneducated in electronics and radio theory. I've offered many times to increase the number of technical articles in *73*, with virtually no positive response. When I ask for a show of hands during my hamfest talks I find that hardly any hams understand how digital communications works—or packet—or even satellite.

Yes, I know, amateur radio is a hobby, so why bother learning anything more than where the mike jack and antenna terminals are located on your rig? You're busy being a lawyer, doctor, truck driver or whatever and don't have time to become an electronic engineer. But what happened to your spirit of adventure? Did your parents fail to help you learn the excitement of exploring new ideas? It's tremendous fun to get involved with slow-scan or 2 meter SSB DXing. It's fun to get involved with RTTY and get together with other RTTYers. I still get letters from the RTTY friends I made back in 1949—even from one now living in V85, if you know where that is.

Computers are terribly complex, but it doesn't take a genius to cope with them and learn how they work, right on down to the microprocessor chips. Like successful dieting, all it takes to get way ahead of 99% of the people in understanding and working with computers is the determination to actually do it.

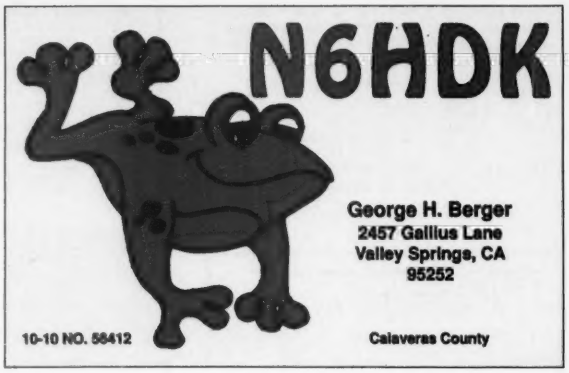
Can we get across to the low-skill workers the precariousness of their jobs? Can we get them involved in activities which will bail them out when the future finally catches up with them? If amateur radio seems too complicated for them, they might take up woodworking, metalworking or some other craft which will build a marketable skill. If they can learn to fix VCRs their future will be very secure. I've got a stack of 'em they can start with. But you know, though we like to posture and brag in front of people about our technical hobby, we all know that getting a ham ticket depends more on persistence than brilliance. We've all heard some of the licensed dummies we've got braying on the air—we just prefer not to let the world know about 'em. Thank heavens they're few in number, so we just give them a wide berth when we hear them.

Anyway, the next time you see a news program with out-of-work people railing against our buying foreign-made products and putting them out of work, just think a little about their stupidity in not seeing this coming and planning for it. Our exports are getting close to our imports in volume, so we have no legitimate complaint about imports. Our efforts to limit imports are a disaster. We're paying almost $250,000 for every automotive job we've saved by limiting Japanese car imports. Phooey.

Teapot Tempests

The ham newsletters have been scraping the barrel lately. Like f'rinstance the FCC, which has been refusing to issue special calls, got forced by the USIA into issuing one for the VOA's 50th anniversary: K3VOA. Sigh. And a judge awarded N5DA $10,000 from N5EWD for some names he was called over the local repeater. Oh yes, the West Coast IARN director quit after an abusive call from Baxter. And WA6ITF is pissed at Baxter for messing with his news reports. An average week.

With KV4FZ presumably QRT after his court conviction, I wonder how the mess he generated on 14.313 is progressing. I suppose there's no real hope of getting Congress to grant a special exemption from prosecution for blowing away the rest of the BARF gang. It's the lack of reasonable loopholes in our laws that are making the Mafia so successful. If we could attract some Sicilian hams, perhaps we could get our bands cleaned up. Lord knows the ARRL seems to have absolutely no interest whatever in the problem. 73



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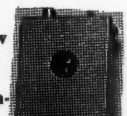

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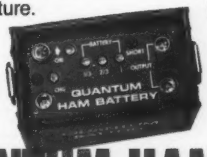

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ANNOUNCEMENTS

PROVIDENCE, RI The NN 1 U Testing Group will conduct VE Exams every 2nd Thursday of the month at 7 PM at the American Red Cross Bldg., 150 Waterman Ave., Providence RI. Walk-ins. Bring a picture ID and one other ID, your license and copy, same for CSCE that you need to upgrade and a copy of Form 610 submitted for Novice license. NN 1 U Testing Group will administer the test to handicapped persons, in their home, within 30 miles of Providence. If necessary, contact ***Judy KC1RI, (401) 231-9156.***

BOULDER, CO The Boulder VE Team will conduct VE Exams the 2nd Monday of most months at St. Mary Magdalene Episcopal Church, Heatherwood Dr. and Cambridge St., Boulder CO. Please bring a picture ID and one other ID; a check or money order payable to "ARRL-VEC" for $5.40; the original of your current license, if any; originals of applicable Certificates of Successful Completion of an Examination if you claim credit for any test elements; a copy of the FCC 610 you submitted if you claim credit for a Novice license not yet received; soft pencils and a calculator. For info, and to pre-register, call ***Barbara McClune NØBWS, (303) 530-2903.*** Pre-registration is preferred, but walk-ins are welcome.

AUG 2

SUGAR GROVE, IL The Fox River Radio League's 1992 Hamfest will be held at Waubonsee Community College, Rt. 47 at Harter Rd., Sugar Grove IL (5 miles NW of Aurora), starting at 8 AM. Set-up Sat. after 7 PM and Sun. 6 AM-8 AM. Flea Market. VEC Exams at 10 AM. You must bring your original FCC license, a copy of your FCC license, and a photo ID. Advance tickets $4/3 stubs; at the gate $5/1 stub. Indoor tables $10/8'. Free parking. Camp grounds nearby. Free Tailgate spaces. Talk-in on 145.470 - 600 W9CEQ. Commercial vendors please call ***(708) 584-1806*** for info. Advance registration deadline is July 15th.

Randolph, OH The Portage ARC, Inc., (ARRL affiliated) will sponsor its 7th annual Hamfair at the Portage County Fairgrounds, just off Interstate 76 between Akron and Youngstown. Gates will be open from 8 AM-4 PM. Advance tickets $3, $5 at the gate. Children under 12 free. Flea Market $3 per space. Indoor tables $8 ea. Computer hobbyists welcome. Talk-in on 145.39 (negative offset). Contact ***Joanne Solak KJ3O/8, Portage ARC, Inc., 9971 Diagonal Rd., Mantua OH 44255. Tel. (216) 274-8240.***

ESCANABA, MI The Upper Peninsula Hamfest/Computer Show, sponsored by The Delta County ARS Inc., will be held from 9 AM-6 PM EDST at the Escanaba Area High-School. The Delta County Tourism & Convention Bureau, Elks Lodge, and Delta County Chamber of Commerce, are co-hosting this event. ARRL sanctioned. Packet, ATV, model airplane demos. Set-ups 6 AM-9 AM. Provide your own power cords, lighting equip., and literature. Each vendor will be expected to donate prizes for the half-hourly raffle from 9 AM-4 PM. The show will provide tables, chairs and benches, electrical outlets (first come, first serve). There is an application fee of $50 per vendor per entry. Tables $6 ea. Outside Flea Marekt $6 per auto-sized space. For info contact ***Hamfest Committee, D.C.A.R.S., PO Box 923, Escanaba MI 49829.***

AUG 8

HUNTINGTON, WV The Tri-State ARA, Inc. VE Team will sponsor VE Exams starting at 10 AM at Our Lady of Fatima church school class rooms, located at 545 Norway Ave., Huntington WV. All test sessions will be W5YI testing sessions. **(This date and location is tentative, please call for confirmation.)** Candidates for new or upgrade licenses should bring a photo ID, copy of current license or original CSCE, and a completed Form 610 (Form 610 will be available at the test session). Walk-ins OK. Arrange to arrive by 9:15 AM in order to register and have ID and Form 610 checked prior to examination. For info contact **Jim Baker K8KVX, (304) 736-6542.**

BEND, OR The Central Oregon Radio Amateurs will hold their 3rd Annual Hamfair at Sunrise Village at Mt. Bachelor, SW of Bend, from 9 AM-4 PM. Free secured overnight parking for self contained RVs. VE Exams from 9 AM-Noon, pre-registration only. Send FCC Form 610, a copy of current license if applicable, and a check for $5.40 payable to ARRL/VEC to: **CORA, PO Box 723, Bend OR 97709.** Deadline is July 15th. Flea Market. Presentations. Seminars. Advance tickets $5 by July 15th; $7 at the door. Tables $10. Tailgate $2. For tickets/info, contact **Don Harrington N7ION, 69706 W. Parkway Meadow, Sisters OR 97759. Tel. (503) 549-7951.**

AUG 9

PEOTONE, IL The Hamfesters RC, Inc., will sponsor their 58th Annual Hamfest/Computer Festival at the Will County Fairgrounds from 6 AM-3:00 PM (exhibits open at 8 AM). Set-up Aug. 8th from 6 PM-Midnight. Commercial exhibitors welcome. Reservations close July 20, 1992. Electricity available outside the Exhibit bldg.; $10 plug-in fee by Fairground. Donation $4 advance, $5 at the gate; under 12 years free. Talk-in on 146.64- STARS and 146.94- KARS. For reservations send SASE and check to ***David F. Brasel NF9N, 7528 W. 109th Place, Worth IL 60482. Tel. (708) 448-9432.***

FRANKFORT, KY The ARRL Central Kentucky Hamfest, co-sponsored by the Bluegrass ARS, Inc., and the Capital ARC, will be held from 8 AM-4 PM at Western Hills High School, Exit 53 off I-64, Frankfort KY. License Exams, technical forums, commercial exhibits, are in air conditioned facilities. Outside Flea Market space, free with paid admission, for each person over 12 years of age. Tickets $5 in advance, $6 at the gate. Tables in commercial vendors area are $15 each if prepaid before July 15th, $25 each after July 15th. For info, tickets, SASE to ***Bobby Rolph KB4QNR, 2117 Winterberry Rd., Lexington KY 40504*** or call ***(606) 278-7570 eves.***

AUG 15

AMARILLO, TX The Panhandle ARC will hold their annual Golden Spread Hamfest at the Amarillo Civic Center, 400 S. Buchanan (in downtown Amarillo) on Aug. 15th. Handicapped accessible. VE Exams. Advance tickets $6, $7 at the door. Tables are $5. Call ***Leland Carpenter N5VRN, (806) 352-8759***, or write to ***Golden Spread Hamfest, PO Box 1524, Amarillo TX 79105-1524.***

AUG 15-16

ALBUQUERQUE, NM The Duke City Hamfest will hold an Event at New Mexico National Guard Armory, 600 Wyoming NE, Albuquerque NM. To get there, take the I-40 South Wyoming exit; the Armory is 3 blocks on the left. Swap Meet. Technical classes. VE Exams. For more info, write to ***Duke City Hamfest, PO Box 6552, Albuquerque NM 87197.***

HUNTSVILLE, AL The 1992 Huntsville Hamfest will be held at the Von Braun Civic Center in downtown Huntsville. Doors will open both days at 9 AM. Activities will all be held under one roof in air-conditioned facilities. Dealer Show. Flea Market. Technical forums. NASA Space Exhibits. Ladies' and childrens' activities. Evening banquets for the entire family. Adult admission is $5 for both days; children admitted free. Talk-in by K4BFT ("Big Fat Turkey") on 146.34/.94. Call ***(205) 880-8004*** or FAX ***(205) 534-5557*** for more info.

AUG 16

CAMBRIDGE, MA The MIT Radio Society, and the Harvard Wireless Club, will hold a Flea Market from 9 AM-2 PM at Albany and Main St., Cambridge MA. Admission $2. Free off-street parking. Covered tailgate area. Sellers $8 per space at the gate, $5 in advance (includes 1 admission). Set-up at 7 AM. For reservations and more info, call ***(617) 253-3776.*** Mail advance reservations before the 5th to ***W1GSL, PO Box 82 MIT BR., Cambridge MA 02139.*** Talk-in on 146.52 & 449.725/444.725 pl 2A - W1XM rptr.

LAFAYETTE, IN Tippecanoe ARA will hold the 21st annual Lafayette Hamfest at the Tippecanoe County Fairgrounds, 18th and Teal Rd. (Ind 25 South). Gates open at 1100Z. Setup Sat. 5 PM-8:30 PM. No rental tables available. Admission $4, at the gate only. VE Exams. Activities for XYLs and children. Talk-in on 146.730/.52. Contact ***Bruce Stewart N9GKE, 315 Hamilton St., West Lafayette IN 47906. Tel. (317) 463-2379.***

GEORGETOWN, DE The Sussex ARA will sponsor the Original Delmarva Hamfest at the Delaware Technical and Community College, starting at 8 AM. VE Exams. Tailgating. CW Contest, and more. Contact ***Bruce Palmer KD3WL, (302)-539-0781*** or ***Bill Hammond N3IOD, (302) 539-5780.*** Talk-in on 147.075+, 224.840.

QUINCY, IL The Western Illinois ARC will sponsor the 7th Annual Tri-States Swapfest at Eagles Alps Lodge, 3737 N. 5th St. from 8 AM-2 PM. Outdoor tailgate area. Indoor vendor tables. ARRL VEC Exams. ARRL table. XYL activities. Advance tickets $2.50, $3 at the door. Talk-in on 146.63/.03, 146.34/.94. Contact ***Jim Funk N9JF, c/o WIARC, PO Box 3132, Quincy IL 62305-3132. Tel. (217 336-4191.***

AUG 20-23

LOS ANGELES, CA The Los Angeles Area Council of Amateur Radio Clubs, and the Orange County Council of Amateur Radio Organizations, will sponsor the ARRL National Convention at the Los Angeles Airport Marriott Hotel. Exhibit hours are: Fri. 6 PM-9 PM; Sat. 9 AM-5 PM; and Sun. 9 AM-1 PM. There will be an Industry Reception on Thurs. Fri. events include an ARRL Educational Workshop and Hospitality Suites. Sat.: Breakfast $12, Swap Tables, Alternative Programs, VE Exams, Luncheon $15, Banquet $30, Wouff Hong. Sun. events: Breakfast $12, Auction, T-Hunt; make checks payable to ***HAMCON Inc., PO Box 570756, Tarzana CA 91356.*** There will be ARRL & FCC Forums, antenna and RFI seminars, DX and contest forums, T-Hunting, ATV, etc. Make your room reservations with the LAX Marriott at ***1-800-228-9290,*** (be

sure to mention "HAMCON 92"). There are special discount travel fares available from Corona Travel Service, Inc. (the official Convention travel agency); Californians contact ***Mark W. Costa KB6GNZ, PO Box 2100, Corona CA 91718. Tel. (714) 737-7000***—outside CA call ***1-800-322-CORP***. Pre-registration before Aug. 1, $12; after Aug 1, $15. 16-year-olds and under, admitted free.

AUG 23

SAGINAW, MI The Saginaw Valley ARA will sponsor a Ham Radio Swap and Computer Fair at the Saginaw Civic Center starting at 8 AM. Set-up at 6 AM. The Swap will be located west of I-75, two miles along the I-675 Bypass. From Exit 2, follow the signs to the civic center. Advance tickets $2, $3 at the door. Advance tables $10, $15 at the door. Send payments with SASE to ***SVARA Swap Committee, PO Box 1783, Saginaw MI 48605-1783***. Admission is *NOT* included with purchase of tables. Unpaid Reserved Tables will be resold at 9 AM. For info call ***(517) 781-3724***. Talk-in on 147.240.

ST CHARLES, MO The St. Charles ARC will sponsor HAMFEST92 at Blanchette Park in St. Charles MO from 6:30 AM-3 PM. Forums and License Exams (10 AM). Free admission and parking. Handicapped parking available. Fee for Flea Market space. Dealers welcome in air-conditioned hall. Talk-in on 146.67 and 444.65 rptrs, and 146.52 simplex. Contact ***Ron Ochu KØOZ, #5 Cricklewood, St. Peters MO 63376. Tel. (314) 278-2510***, or call ***Eric Koch NF0Q, (314) 946-0948 eves***.

MARYSVILLE, OH The Union County ARC will sponsor their 16th Annual Marysville Hamfest/Computer Show at the Fairground in Marysville OH (near Columbus). Overnight camping with electric and water hook-ups will be available on a first come basis. Free entertainment Sat. night. Undercover areas and buildings for set-up. 10' x 10' space $5. Commercial vendors, please act fast to reserve space. Admission $4 advance, $5 at the gate. Contact ***Gene Kirby W8BJN, 13613 US 36, Marysville OH 43040. Tel. (513) 644-0468***.

CRYSTAL LAKE, IL The Tri-County Radio Group (ARG) will hold a Radio/Computer Fest at Crystal Lake Holiday Inn. For info call ***Bob N9KXG or Ken N9KSP*** at ***(708) 658-1678 or (708) 658-3566***.

MULLICA HILL, NJ The Gloucester County ARC will hold its 15th annual Hamfest/Computer/Electronics Fair at the 4H Fairgrounds, Route 77. Advance tickets $3.50; $5 at the gate. Tailgating $5 per space. Vendors $7 per table. Electricity available. Set-up at 6 AM. General Admission at 8 AM. VEC Testing: Registration 9 AM-9:30. Testing begins at 10 AM. Talk-in on 147.78/.18 and 223.06/224.66. Enjoy our open-air Breakfast and Lunch. Contact ***GCARC, PO Box 370, Pitman NJ 08071***, or call ***(609) 478-4738***.

AUG 28-30

VERNON, B.C., CANADA The 1992 Sky High Hamfest, sponsored by the Okanagan Valley Hamfest Assn., will be held at the Silver Star Mountain and Resort area. The event will be organized by the North Okanagan RAC. RV accomodations, hotels, restaurants available. Non-Ham activities. For info, contact ***Sky High Hamfest, PO Box 1706, Vernon, B.C., Canada V1T-8C3***.

AUG 29

NEWPORT, NH Newport Area Hams will host the Sugar River Amateur Radio Summer Festival from 7 AM-4 PM. Tailgate Flea Market. VE Exams. Craft Fair. Book Sale. Special Event Demo Station. Outdoor Folk Concert at 6:30 PM. Flea Market admission: Sellers $5 (set up at 7 AM); Buyers $2 (admitted at 8 AM). Talk-in on 146.76/.16, 224.12/22.52 and 146.52. No tones, please. Contact ***Bruce C. Bedford KA1ORB, 178 Summer St., Newport NH 03773. Tel. (603) 863-1698*** or ***Bob Boyd N1CIR, (603) 863-5383***.

ROSEAU, MN The Lake of the Woods Rptr. Assn. Inc., will sponsor a Hamfest at the High School Gym, Highway #11 East. Set-up at 8 AM. Doors open at 10 AM. Buffet Banquet at 4:30 PM. VE Exams. ATV & Packet demos. Flea Market. Auction. Tables free with advance registration. Admission $10 all incl. Reservations are necessary. Contact ***David Landby KB0HAP, Rt. 3, Box 10, Warroad MN 56763. Tel. (218) 386-1092.*** Talk-in on 147.09+

AUG 30

MILFORD, CT VE Exams for all classes will be held at the Fowler Bldg., 145 Bridgeport Ave., Milford CT, beginning at 12 noon. Walk-ins welcome. For info call ***Gary NB1M, (203) 933-5125***, or ***Dick WA1YQE, (203) 874-1014***. This testing is sponsored by the Coastline Amateur ARA.

LEBANON, TN The Short Mountain Repeater Club will sponsor a Hamfest at the Cedar of Lebanon State Park, US Highway 231, seven miles south of I-40. Outdoor facilities only. Exhibitors bring your own tables. Space available on a first come basis. Free admission. Talk-in on 146.91. Contact ***Mary Alice Fanning KA4GSB, 4936 Danby Dr., Nashville TN 37211. Tel. (615) 832-3215***.

SPECIAL EVENT STATIONS

AUG

CHANNEL ISLANDS, CA KK6EK will operate during research expeditions for the month of August, to celebrate the 15th anniversary of the founding of Cordell Expeditions, a volunteer research group that was responsible for creating the Cordell Bank National Marine Sanctuary. Operation will be SSB, principally on 20m, usually 14.328. For special expedition QSL and info, contact ***KK6EK, Cordell Expeditions, 4295 Walnut Blvd., Walnut Creek CA 94596.***

AUG 4-5

PADUCAH, KY The Paducah ARA, in conjunction with the Paducah Police Dept., will operate W4NJA, to commemorate the 1st Annual Paducah Police Dept. D.A.R.E. Daycamp. Operation will be from 1400Z-2100Z. "D.A.R.E." stands for Drug Abuse Resistance Education, and the daycamp will be looking for contacts with all amateurs, expecially other D.A.R.E. participants. Operations will be in the lower 25 kHz of the 20m phone and the lower 50 kHz in the Novice 10m phone bands. For a special D.A.R.E. QSL, send an SASE to ***John Hudson KC4HGX, 3214 Lorine Ln., Paducah KY 42001***.

AUG 4-7

BLOOMINGTON, IL The Central IL RC will operate W9AML 1700Z-2400Z Aug. 4-7, in conjunction with the McLean Co. 4H Fair. Operation will be in the General portion of 80-15m and the Novice portion of 10m. For QST send QSL and SASE to ***CIRC, PO Box 993, Bloomington IL 61702.***

AUG 8-9

MOUNT DAVIS, PA The Somerset County ARC will operate Station KC3XD from the highest point in PA, at Mount Davis. Operations will be on the Lower 50 kHz of the General phone bands of 10-80m, as conditions allow. Send QSL and SASE to ***Sherman Gary KC3XD, 708 Casselman St., Confluence PA 15424.***

AUG 11-16

SANDUSKY, OH The Firelands ARA will operate Station WB8LLY Aug. 11 thru Aug. 16, during the Erie County Fair at the Heritage Barn to commemorate the 200th anniversary of the Connecticut Legislature setting aside the Firelands (in 1792), to compensate people that were burned out of their homes by the British during the Revolutionary War. Operation will be in the lower 50 kHz of the General phone subbands on 80m, 40m, 20m, 17m, 15m, 12m, and starting on the 10m Novice phone subbands (28.400) daily during the Fair. Radiograms for the Erie County area will be accepted via WB8LLY @ WB8JUI packet station. For certificate, send 9 x 12 SASE with two postage stamps affixed; QSL with contact number to ***Tim N8AHK, 1307 Fifth Street, Sandusky OH 44870-4201.***

AUG 14-16

SEATTLE, WA The Boeing Employee's ARC will operate a Special Event Station from the Museum of Flight, to commemorate the 50th Anniversary of the 1st Flight of B29. Frequencies: 28.400 MHz, 21.360 MHz and 14.280 MHz. Operating time will be 1700-2400 UTC. A QSL card with a black and white glossy photo of the B29 in flight will be sent to all who contact the Boeing ARC Special Event Station.

AUG 15-16

VANCOUVER,WA The Clark County ARC will operate Station W7AIA from the Evergreen Flying Field, just east of Vancouver WA, to help celebrate the 33rd annual Antique Aircraft Fly-in. Operation will be in the lower portions of the 40m, 20m and 15m bands (phone); they also expect some operation on the 75m phone band during the night. A very nice certificate will be available. Send your SASE (only) to ***CCARC, PO Box 1424, Vancouver WA 98668***.

AUG 22-23

LOS ANGELES, CA SE Station W1AW/6 will operate from the 1992 ARRL National Convention Aug. 22 and 23. Frequencies: General subband of 80m, 40m, 20m and 15m; Novice subband of 10m; and the VHF/UHF bands. For a certificate, send QSL and a 9 x 12 SASE to ***Hamcon, Attn: Dick Bruno N6ISY, PO Box 570756, Tarzana CA 91356.***

AUG 29

WRENTHAM, MA N1APE and N1IPR will operate from the Wrentham MA State School Cracker Barrel Fair and Hot Air Balloon Festival, Aug 29, 1400Z-2200Z. Frequencies: -7.243, 14.243, 21.343, 28.343. QSL and SASE for certificate to ***N1APE, 8 Abenaki Trail, Littleton MA 01460.***

AUG 29-30

WELLSBORO, PA The Tioga County ARC will operate Station WO3C from 1400Z Aug 29-1800Z Aug. 30, to celebrate the 99th anniversary of the Pennsylvania Park System. Operation will be in the lower portions of the General 80m, 40m, 20m, 10m. For QSL, send QSL and SASE to ***Darlene Rahn WO3C, Box 200 R.D. #6, Wellsboro PA 16901.***

SEP 4-5

BRADY, TX The Heart of Texas Ham Operators' Group (HOT HOG) of Brady, together with the 3M A.R.C. and the Brownwood ARC, both of Brownwood TX, will operate Station WD5H from the 19th Annual World championship Barbecue Goat Cookoff and 15th Annual Arts & Crafts Fair at Richards Park in Brady TX. This operation from the "geographic center of Texas" will take place primarily on SSB phone or about 28,325, 21,325, and 14,325 MHz, from 2000Z Sep. 4-2000Z Sep. 5. Rag chews are welcome. Some operators of this station may move off to other modes/frequencies at their discression. Ask if you are interested. For a certificate send your QSL and SASE to ***HOT DOG, c/o Larry W. Garens WD5H, 702 Bee St., Brady TX 76825-3014.***

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Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to the Barter 'n' Buy, Sue Colbert, 70 Rt. 202N, Peterborough NH 03458 and get set for the phone calls.

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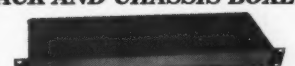

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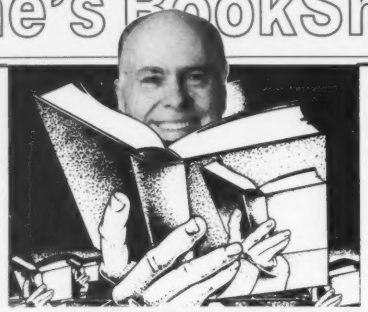

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RANDOM OUTPUT

David Cassidy N1GPH

Contests

For almost a year now, I've been receiving a lot of letters and phone calls concerning contesting. Every hamfest I've been to this year has included at least one heated debate over the pros and cons of contesting. The general feeling is that contesting has gotten out of control.

Not being an avid contester, it would be easy for me to sit down at the word processor and write a fiery condemnation of contests and how they can be blamed for everything from QRM to the S&L crisis. In exchange for not doing that, I expect any avid contesters reading this to try to keep an open mind and look at things from another's viewpoint before taking crayon in hand and writing me hate mail. Let's see if we can have a reasoned and thoughtful examination of what's really happening.

Let's examine a few facts. It is a fact that there are a lot more contests these days than there used to be. The feeling of non-contesters is that there is a major, band-filling contest almost every weekend. While this is certainly an exaggeration, it does go to show the level of frustration felt by the non-contesting ham population.

It is a fact that a major contest makes any other type of communication on a certain band impossible. It seems that contesters feel that the rules about intentional interference and asking if a frequency is in use (which implies that you listen for a response and act accordingly) are not in effect during contests. Just listen to any frequency where a QSO is in progress at the starting time of any major contest. It doesn't take but a few minutes for a contest to take over a band, forcibly evicting any other amateurs.

It is a fact that contesting has become more and more automated as logging software, memory keyers, digital voice recorders and computer-controlled rigs have become more common. I've heard contesters who didn't key their mikes and actually speak a live word for over three minutes at a stretch.

There are two ways we can approach this issue. We can ignore it (which is what every avid contester I've talked to has advocated) or we can realize that we have a bit of a problem here, act like mature adults and come up with a compromise to benefit amateur radio. Other ways to approach the issue of contesting have been suggested, mainly petitioning the FCC to limit contest time and frequencies. Anyone who thinks the FCC wants to be bothered with this is woefully misguided and should sit in a cool, dark room until the feeling passes. (When are hams going to finally realize that the FCC doesn't like amateur radio; they hate dealing with amateur radio; and every time we force them to spend time on our petty problems and infighting we get one step closer to the end of the Amateur Radio Service?)

Ignoring this issue is certainly unfair to the majority of hams who are not contesters. After all, they're not asking for anything extraordinary. They just want to be able to practice their hobby, the same way contesters want to practice theirs. That leaves us with only one way to deal with this growing problem: compromise.

In the spirit of beginning a dialogue, I submit—in no particular order—the following ideas as a starting point.

1. Regulation of contests is the responsibility of the contest sponsor, *not the FCC*. If you have concerns about how contests are run, you should be writing to the sponsoring organization, *not the FCC*. If you are a sponsoring organization, you should be monitoring your contests for adherence to the rules and good amateur practice.

2. I don't think it is too much to ask that contest operating be confined to a portion of each band, leaving a portion for other amateur activities. We have band plans and "gentlemen's agreements" for all other types of special interest activities, so why not contesting? If contest sponsors will do this voluntarily, those who are shouting for FCC action no longer have an argument.

3. If special "contest zones" are set up, non-participating stations should have the courtesy to take their operations to non-contest frequencies for the duration.

4. Contesting was conceived as a way to sharpen operating skills while having a little fun (and maybe having a chance to work a rare state, zone, prefix, county, country, etc.). Automatic contacts do nothing to improve operating skills. I propose that any automation affecting the transmitted signal (i.e. memory keyers, digital voice recorders, computer-controlled rigs) should be banned. Contests should be a test of skill, not a measure of how much money you have.

5. A reasonable power limit should be placed on all contest stations (I would propose 100 watts). Remember, this is supposed to be a test of your *operating* skills, not a test of your MasterCard limit.

6. As hinted at in #1, it is the contest sponsor's responsibility to make sure their contest is not causing problems. To that end, I would suggest that each contest have a group of Official Contest Observers. These stations, whose callsigns could be advertised in advance, would be responsible for observing operations during the contest. They could advise stations when they were overdriving their processors, operating out of the contest band or interfering with another station. Any serious violations of FCC or contest rules could be reported to the contest sponsors, disqualifying the offending party. If contesters knew there was a good chance their scores would be disqualified, maybe you'd hear a lot less interference and 10-kHz-wide splatter.

7. Contest sponsors should take a hard look at their contest schedule to determine if any of their contests are duplicating the efforts of another sponsor. If they do, why not get together and eliminate some of the duplication. There is a fine line between offering a way for hams to have some fun and using a contest as a form of advertising.

I hope these ideas help to generate a dialogue between contesters and non-contesters. Write down your thoughts and send them in. We'll publish a representative sample of any letters we get.

It is in our own best interest to deal with this before the FCC does it for us. There is room on the amateur bands for everybody. All we have to do is cut each other a little slack and work out our differences constructively. 73

Number 29 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 East Chateau Circle
Payson AZ 85541

As this is written, the solar flux has just declined (for a day or two) to its lowest value in several years: 99. This means that the sun has indeed departed an extraordinary "plateau" of medium-to-high flux values that lasted for almost a year. As I mentioned before, it now appears that Cycle 22 did have a double peak, which extended the very good conditions on the HF bands longer than usual. However, unless this cycle will be longer, overall, than usual (and I don't think it will be) then we can expect a more rapid decline in solar flux values between now and the minimum in a few years. The "saddle" between the two peaks (1989-1992) provided some exceptional extended DX opportunities which we'll now have to forego and learn to live with diminished propagation conditions for the next several years. That is NOT to say there will be NO DX . . . just that it will be increasingly rare and will come and go more quickly.

August will NOT be a spectacular month for HF-band propagation. Conditions will range from Poor (centered around the 8th) to Good (centered around the 12th and 27th) to Fair for the remainder of the month. As always, you may expect these periods to vary one way or the other (later or earlier) by a day or two.

August is a transitional month between summer doldrums and fall brilliance. The "conditions" outlined above are trending toward seasonal improvement (September and October) and there will be some excellent, but rare, DX opportunities this month. Check the Good days and keep alert for sudden changes in WWV's eighteen-minutes-after-any-hour updates. The Boulder "A" index shows how ionospheric absorption values vary with daily averages (the higher the number, the higher the absorption) and the Boulder "K" index is a six-hourly average of magnetic field flux values. Both, of course, are related to magnetic field activity which can range from quiet to unsettled to active to minor storm and major storm levels. In general, the higher the solar flux and the lower the A and K indices are, the better conditions will be. The reverse is also true. 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	–	–	–	–	–	–	20	–	–	–	–	–
ARGENTINA	20	20	20	40D	40D	–	–	–	–	–	10	15
AUSTRALIA	–	–	–	20	20	40D	20D	20D	–	–	–	–
CANAL ZONE	15	20	20	–	–	–	20	20	20	–	10D	15
ENGLAND	20	–	40/80	40/80	–	–	–	–	–	20	20	20
HAWAII	15D	20	20	20	40D	40D	–	–	–	–	–	15D
INDIA	20D	20D	–	–	–	–	–	–	–	–	–	–
JAPAN	–	–	–	–	–	–	20	–	–	–	–	–
MEXICO	15	20	20	–	–	–	20	20	20	–	10D	15
PHILIPPINES	–	–	–	–	–	–	20D	–	–	–	–	–
PUERTO RICO	15	20	20	–	–	–	20	20	20	–	10D	15
SOUTH AFRICA	–	40	40	20D	20D	–	–	–	–	–	20D	20D
U.S.S.R.	20	20/40	20/40	–	–	–	–	–	–	–	20	20
WEST COAST	40	80	–	–	–	–	–	20	20	20	15	40

CENTRAL UNITED STATES TO:

ALASKA	–	–	20D	–	–	40D	–	20	–	–	–	–
ARGENTINA	20/40	20/40	20	40D	–	–	–	15	15	15	15/20	20
AUSTRALIA	15D	15D	15/20	20	20	40D	20	20	–	–	15D	15D
CANAL ZONE	20	20	20	40D	40D	–	–	20	20	15/40	15	10D	10D
ENGLAND	20	–	40D	40D	–	–	–	20D	20D	–	–	20	20
HAWAII	15	15	20	20	20	40D	20	20	–	–	–	15D
INDIA	20D	20D	–	–	–	–	–	20D	20D	–	–	–	–
JAPAN	–	–	20D	–	–	40D	–	20	–	–	–	–	–
MEXICO	20	20	20	40D	40D	–	–	20	20	15/20	15	10D	10D
PHILIPPINES	–	–	–	–	–	–	–	20D	20D	–	–	–	–
PUERTO RICO	20	20	20	–	–	–	–	20	20	15/20	15	10D	10D
SOUTH AFRICA	–	–	40D	20D	20D	–	–	–	–	–	–	–	–
U.S.S.R.	–	–	–	–	–	–	–	20D	20D	–	–	–	–

WESTERN UNITED STATES TO:

ALASKA	–	–	–	20	20	20D	40D	20D	20D	–	–	–
ARGENTINA	15	20D	20	20	–	–	–	20D	–	–	–	15
AUSTRALIA	15	15	15	20	20	20/40	40	20/40	–	–	–	–
CANAL ZONE	10D	15	20	20	40D	40D	–	20	20	–	15	10D
ENGLAND	20	20	20D	–	–	–	–	20D	–	–	–	20D
HAWAII	15	15	15/20	20	20	20/40	40/80	–	20	–	15D	15
INDIA	–	–	20D	20D	–	–	–	20D	20D	–	–	–
JAPAN	–	–	–	20	20	20D	40D	20D	20D	–	–	–
MEXICO	10D	15	20	20	40D	40D	–	20	20	–	15	10D
PHILIPPINES	–	–	–	20D	20D	–	–	20D	20D	–	–	–
PUERTO RICO	10D	15	20	20	40D	40D	–	20	20	–	15	10D
SOUTH AFRICA	–	–	–	20D	20D	–	–	–	–	–	–	–
U.S.S.R.	20D	20D	20D	–	–	–	–	20D	–	–	–	–
EAST COAST	40	80	–	–	–	–	–	20	20	20	15	40

Note that a (D) will indicate a difficult path. Try on days when the geomagnetic field is quiet (G) and when solar flux is 100 and greater.

AUGUST 1992

SUN	MON	TUE	WED	THU	FRI	SAT
						1 G
2 F	3 F	4 F-G	5 G-F	6 F-P	7 P	8 P
9 P	10 P-F	11 F-G	12 G	13 G	14 G-F	15 F
16 F	17 F	18 F	19 F	20 F	21 F	22 F
23 F	24 F	25 F	26 F-G	27 G	28 G	29 G-F
30 G-F	31 F					

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- Adjustable RF Power
- Variable Threshold Noise Blanker
- Optional Digital Voice Recorder (DVS-2)
- Front Panel RX Antenna Selection
- **Accessories:**

FT-990DC	Available without power supply
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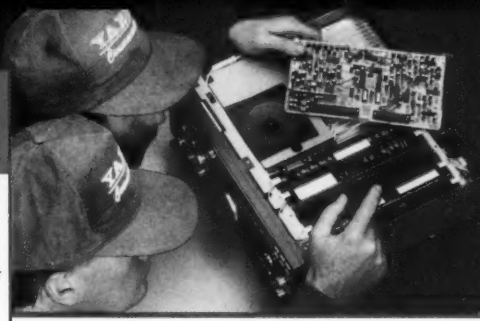
XF-445K	2nd IF CW Narrow 250 Hz Filter
TCXO-2	High Stability TCXO
SP-6	External Desk-top Speaker
MD-1C8	Desk Microphone
DVS-2	Digital Voice Recorder Unit
YH-77ST	Lightweight Headphones
LL-5	Phone Patch Unit for SP-6 Speaker



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The innovative technology of the FT-990 is inside, not outside. Like the exclusive dual digital SCAF (Switched Capacitance Audio Filter). And for long term reliability, the motherboard/plug-in module construction eliminates inter-board wiring. The FT-990 also has the same undisputed receiver performance of the FT-1000 as well as other features such as a high-speed, built-in antenna tuner with automatic storage. And, multiple DDS (Direct Digital Synthesis) for quick lock-up time and low level noise. What's more, for maximum efficiency, the FT-990 is a self-contained base station with its space-saving, built-in AC power supply.

Outside, the very functional HF front panel is simple and uncluttered with a large amber display. Easy to use, easy to see. Pure and simple QSO enjoyment – with muscle when you need it! Yaesu makes "high-tech" effortless. Now it works for you, not against you. Have your dealer show you the FT-990 today and see what we mean.

New

FT-990DC now available.

YAESU

*Performance without compromise.*SM

High-tech innovation isn't miniature knobs, switches, and tiny labels.

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Specifications subject to change without notice. Specifications guaranteed only within amateur bands. Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.

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Like a cheetah in pursuit of game, Kenwood's newest HF transceiver blends intense efficiency with swift, surgical precision. State of the art, pure and simple. Offering superb TX/RX performance plus exceptional signal purity, the TS-950SDX establishes a new benchmark for HF communications.

- Built-in DSP (digital signal processor)
- Dedicated Power MOS FET final section
- User-friendly design and menu system

Kenwood meets or exceeds all specifications. Contact your dealer for a complete listing of specifications and accessories. Specifications are subject to change without notice. Complete service manuals are available for all Kenwood transceivers and most accessories. One year warranty in the U.S.A. only.